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[Founded in 1849 as the "Journal of Gas Lighting."]

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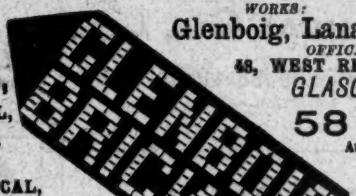

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CLIII., No. 3018.] WEDNESDAY, MARCH 16, 1921. [73RD YEAR.

EDITORIAL NOTES.

The Abandonment of the Sliding-Scale.

THE new system of dividing profits between consumers, stockholders, and employees, which has supplanted the sliding-scale in the case of the South Metropolitan Gas Company, has attracted widespread attention; some other important gas undertakings are adopting it; and outside the gas industry it is being considered as the basis of practical means for reconstructing the relations between capital and labour. The South Metropolitan Company has been the centre of much innovation of value to the industry. It was one of the first undertakings to introduce the sliding-scale, in the origination of which on the well-known lines Sir (then Mr.) George Livesey took such prominent part; it is the first to abandon it, and to substitute something that is acknowledged—freely in some cases, with an economy of fervour in others—to be an improvement upon it. Why this abandonment and substitution? The prime mover in it is the present Chairman, Dr. Charles Carpenter; and for the final contribution to our present series of special articles treating of the heat-unit basis of working in the gas industry, we asked him to explain the causes which moved him to this action. He kindly consented; and the result is given, with excellent concentration, in the special article to-day.

From beginning to end, the argument is based on plain facts; but though the facts be plain, some people appear to have difficulty in placing them in proper order, and giving them sufficient weight. What seems to be lacking is that an inadequate measure has been taken by some intelligences of the changes that have been effected by the war and the aftertime. In part these changes had begun to show themselves prior to the war, and were even then attacking the fundamentals of the sliding-scale, and altering the balance of things in such a way that all the great exertions that were made for extending business were not proportionately rewarded by increased profit distribution to the holders of capital. When this is the case in the commercial sphere, it is a demonstration that something is radically wrong. What commenced before the war was accentuated by the war to such a degree that, in order to do something more than is being done to recapture the interest of the investing public in the industry, it would have been better to have removed once and for all from the sliding-scale those defects which have proved so disastrous. But this is not what is being generally done. There is a disposition to amend by the simple process of shifting from one position to another in respect of the standard price of gas, with the opportunity of, if need be, repeating the process. The gas stockholder and the gas worker in relation to dividends and share in profits are supposed by many to be outside the pale of psychological effects. But those of us who are of contrary belief, and regard these two important elements in our industry as only human, are of opinion, first, that a minimum dividend (with a good chance of accretion) after what has happened will be a consoling and material thing to many present disappointed gas investors, and an inducement to the entrusting of further money to the same industry, and, secondly, that a statutory right to participation in excess profits will promote effectively new feelings and a new spirit among the employees.

Dr. Carpenter speaks highly of the Gas Regulation Act; but he does not believe it will be a good thing for the industry to be fettered indefinitely by the financial restrictions that are continued by the first part of the measure. Fortunately, an escape from them is provided under section 10 by a Special Order; and we are of opinion that, as the political outlook develops, there will be a greater and still greater number of gas administrators who will follow the South Metropolitan precedent. A change of policy, when left to the determination of many, takes time to root and spread. Low dividends form the strongest possible inducement to rectify them by the shortest possible cut. Revision for the purpose of rectifying proved defect, and to reinforce the bonds between the three essentials to enterprise, is something that, where thought of at all, is often left—that is the pity of it!—to a more convenient season, which sometimes never seems to come.

Our contributor dips into history, first to show what led up to the introduction of the sliding-scale. Long before the war those who thought it was going to be a positively effective instrument in ensuring in all cases "due care in "management" were found to be mistaken. Some years before the war, it was recognized that the sliding-scale might become a heavy hardship on good management. Radical changes set in which began to monopolize the greater part of the higher reward which extending exertions in enterprise by the gas suppliers should have bestowed upon them. We read that Sir George Livesey himself had some misgivings that all was not well; and in the last few years of his life, he struggled hard against rising coal costs, which threatened to undo some of his many years of labour for low-priced gas, though perhaps it should be said that, except during the Boer war, the sliding-scale was not subjected to a real test of its soundness. "It succeeded as it did because "it was called upon to do so little." This sentence is full of meaning. When called upon to bear more, the sliding-scale collapsed. In all cases where it is retained in its old form, it will be called upon to do more in the future, and to meet greater vacillations. No reasonable person can say, looking at the drastic alterations that have been made during the war, that the curve of economic conditions is going to get to a level that will show year in year out a fair normality. The proper thing after the lessons of the war and since is to legislate with a view to assuring ourselves as positively as it is possible to do so against conditions that may fairly be anticipated.

Having set forth the reasons for a departure from the sliding-scale, Dr. Carpenter shows us the principles that were adopted in modelling something better. They are good and right principles; and, relatively to the old sliding-scale, they give to the finished scheme a larger foundation and more comprehensive effects—one of which is the assurance of a minimum dividend, and another the statutory right of the employees to a share in any excess profits after reducing the price of gas below the basic figure. In this latter a link is forged between an undertaking and those who work for it, which supplies an assurance of a higher standard of interest being cultivated. This would be good in all times; having regard to contemporary tendencies, it is wise. "It is my opinion the sliding-scale has had its day, "and that the time is ripe for adopting a new conception "of the mutual obligations of industry (in the widest sense "of the word) to consumer, shareholder, and employee." So writes Dr. Carpenter; so will believe many who read his explanatory article.

The Loss of a Noble Friend.

A GREAT man has passed from our midst; but so suddenly that those of us who were within recent times in contact with him, and listening to the eloquence of a powerfully rich, cultured, and penetrating mind, can hardly realize that the Rt. Hon. Lord Moulton, K.C.B., G.B.E., F.R.S., is no more. He has passed hence with, upon him, the respect

and reverence, in glorious abundance, of his fellow men. He gained this by possessing more than a title of nobility; he was noble by nature—noble in mind and intellect. His gifts knew no bounds. He lived in their enjoyment; they brought him pleasure, and they gave pleasure, encouragement, and counsel to many. His services, so far as his physical endurance and time would permit, were freely at the disposal of country, science, and technical organization. The Courts claimed him professionally. There he gained the highest distinctions—not that he sought them. He went to the top and to the House of Lords, not by the relatively easy political route, but because it was at the top that Nature destined him to be. The same in scientific life. He was a scientist, and he loved science—chemical and physical—because his bent of mind was so largely in that direction.

It was through this that the Government invited him to become Director-General of High Explosives Supplies, when the allied armies were being violently thrust-back through the preparedness of the Germans in this direction, and the unpreparedness of this and the allied countries. This appointment was one of the first good things the Government did in the early stages of the war. He was the right man in the right place; and never has the apothegm been better applied. His remarkable attainments, combined with his powers of organization and of personal influence, achieved for the country something beyond recompense. Lord Moulton knew the gas industry and its work long before this. He had been concerned in it in his legal practice; but a stronger bond was that his scientific mind and interest were attracted to it because it was the one industry that, with the highest efficiency, unbound and let loose the valuable substances Nature had stored in coal. Lord Moulton, on his appointment to that high and responsible position, turned to the gas and coke-oven industries for their assistance. What he asked for was readily conceded. It is all history now—history that is written in our pages. But Lord Moulton was the most generous in his acknowledgment of the services. He appreciated because he understood; others did not understand, and thus did not appreciate to the full. This work led to greater intimacy with the gas industry. Something of the capacity of that brilliant mind, something of its explorations in spheres outside its more immediate interests, something as to the critical observation of fundamentals, tendencies, needs, and prospects were revealed in a manner which surprised, through his subsequent addresses, when on succeeding occasions he honoured the Institution of Gas Engineers, the Society of British Gas Industries, and the British Commercial Gas Association, by occupying their Presidential chairs. He knew of the gas industry as one who had lived in it. His knowledge of its potentialities and of its development impeding statutes, was vast; and he made a clear call to the industry to break through the fundamental obstacles to progress. The prospects which he, with his magnificent understanding and perception, was able to visualize, demand for their materialization the exercise and concentration of our best faculties. That he saw, and that he urged. He put before the industry high standards and high ideals; and he knew the industry would have to work for them actively, if there was to be even an approach to attainment. He was a guide, philosopher, and friend who was worthy of the highest affection and esteem; and from the men of the gas industry he had both.

A life of noble work has been spent. The fruit of it abides. To the memory of a distinguished friend, homage is paid by the administrative, official, and manufacturing ranks of the gas industry.

Inerts and Indefiniteness.

It is quite natural the official representatives of the London County Council should be of the opinion that a limitation should be placed upon the proportion of inerts in gas supplied for town use—no matter the conditions of the producing undertaking in regard to magnitude, no matter that its plant and refractory materials depreciate, no matter the pressure upon the concern through our climatic vagaries—in fact, no matter anything at all pertinent to the question. If they did not hold such an opinion, they would be breaking the ancient line of consistency in the obstructive policy of the Council to gas supply. But it is not the opinions of Mr. James Ollis, the Chief Officer of the Public Control Department of the Council, or of Mr. R. B. James, the Chief Gas Examiner, or the deductions they choose to make from other people's work, that the Board of Trade Committee on Inerts require; they want evidence which will be of value to them in leading to a determination as to whether or not it is "necessary or desirable" that there should be limitation. These words "necessary or desirable" require to be kept well in view in endeavouring to help the Committee; and there is very little that can assist the Committee in personal opinion, vagueness, and an incomplete appreciation of the meaning and value of the data available—such as the tabulated statements in the reports of the Gas Investigation Committee—and which are best explained by their responsible authors.

Figures were quoted by Mr. Ollis as to the wartime inert content of the gas in certain areas. In justice to him, be it said, he did indicate that he did not put these forward other than to show what has happened. If a condition due to abnormal circumstances has no special value, then in the name of common sense and consideration for the time of the Committee, why trouble them with the figures? The Committee cannot base conclusions on such conditions. What the Council witnesses proved most conclusively was that there was a dearth of data acquired from direct investigation on their own part, and that they have been totally unable to appreciate exactly the value of the Gas Investigation Committee's reports. In utilizing the results of the tests in these reports, it must be borne in mind that the gases are largely diluted by pure nitrogen and pure carbon dioxide to show what will happen in the circumstances, but this is not the same thing (as Mr. W. J. Atkinson Butterfield pointed out) as causing dilution with a mixed gas. The conditions of use have also to be considered; and what the data of the Gas Investigation Committee do conclusively show is that, if the bunsen burner is modified so that the same amount of heat units is transferred to the head of the burner, and the primary air supply is adjusted to the requirements of the gas, no harm in relation to efficiency in all low-temperature operations is done to the consumer, and that there can be over 30 p.ct. of inerts before high-temperature operations—such as in the incandescent burner—are noticeably affected. This being so, is it desirable that at this developing stage in public service there shall be any limitation whatever placed upon the manufacture of gas which may have a detrimental effect upon invention and economy?

If, too, the County Council representatives will study Table 34 in the 1919 report, they will find how little large variations in the concentration of calorific value per cubic foot of gas affect the B.Th.U. per cubic foot of the mixture produced by adding the necessary air for complete combustion; and if they like to take the investigation further, they will see how little the variations in the quantity of inerts in the gas itself affect the volume of inerts in the gas-air mixture, owing to the difference in the volume of air required for combustion. But in their anxiety to assure the Committee that in their view, under the conditions of the experiments of the Gas Investigation Committee, the gas consumer is to "some extent" harmed by the presence of inerts, they overlooked matters which have a very important bearing upon the question, and which cannot be ignored when deciding whether it is "necessary" to limit the amount of inerts in gas. But they would not define the line at which in their view there should be limitation. They much preferred to deal with generalities, and not with definite proposals. Perhaps they were wise. But they did point to the low inert content of the South Metropolitan Company's gas. They did not describe the scrupulous care that is taken in this matter at the South Metropolitan works, and the work that has to be done in machining the surfaces at the retort-lid joints so as to maintain them in an air-tight condition; and they made no reference to the strong plea of the Chairman of the Company (Dr. Carpenter) that the gas industry should be free from the suggested limitations. Dr. Carpenter is a gas engineer, a gas manufacturer, and a gas administrator—neither Mr. Ollis nor Mr. James has any one of these qualifications. There was also reference to the Uddingston vertical retort plant and the low inerts in the gas produced by it. But gas undertakings cannot adopt new plant and processes at a moment's notice; nor can they prevent plant and refractory materials depreciating; nor can they obviate all those changing circumstances which affect concerns in different manner. Gas undertakings will naturally do their utmost to keep the percentage of inerts at the lowest possible amount when working gets into full swing upon the heat-unit basis. But, apparently, in the official

quarters of the London County Council, gas administrators and technical officials have no credit in respect of common sense, and so there should be definite restriction.

Examining the evidence carefully, the only harm arising from the distribution of inerts that the County Council witnesses have discovered is that the capital employed in distribution is not (owing to the presence of inerts) put to the best possible use, and the consumer therefore suffers. The consumer has not realized any suffering of the kind up to the present with all the wartime experiences. Owing to so much gas being now used in day time for heating, and higher pressures being employed, the distribution plant is put to better use than formerly. If Mr. Ollis and Mr. James will look at the table in Mr. Stephen Lacey's paper printed in our issue for Dec. 22 last [p. 699], they will see that the capital charge of the Gas Light and Coke Company in respect of mains and services, was in 1909 3d. per 1000 c.ft. of gas sold, and 1·8d. in 1919. It may be pointed out that the reduction is partly due to the lower dividend; it is also due to the increasing day use of gas. Another thing is that the capital employed per 1000 c.ft. of gas sold in respect of mains and services—despite these terrible inerts—was 3s. 1d. in 1909 and 2s. 6d. in 1919. What harm has the consumer suffered so far—despite wartime and after gas composition conditions—in respect of capital charges on distribution? It is wonderful how the theories of the restrictionists are falling foul of the actualities of practice. We do not say that, providing there are no compensating economies, the place of avoidable incombustibles is not better occupied in the distribution plant by combustibles; but we do not so far trace any harm to consumers in respect of capital charges. And we do not anticipate that, under the heat-unit basis of working, distribution capital charges will ascend on account of inerts. The County Council witnesses have added to the testimony as to the frailty of the case for restriction.

The Carbon Monoxide Inquiry.

DURING the war the Ministry of Reconstruction turned their attention, through Committees and Sub-Committees, to the question of the conservation of coal; the Board of Fuel Research sent to the Board of Trade a report on gas standards, the fundamental feature of which was liberty for the gas industry, with a view of enabling it to render greater service to the public; and since then Lord Newton's Committee on Smoke and Noxious Vapours Abatement have reported in favour of everything possible being done to encourage the use of gaseous fuel as one of the best means of reducing the pollution of the atmosphere, and so rendering it healthier and less injurious. Now we have the Board of Trade Committee, presided over by Sir William Pearce, considering whether or not a block to the full attainment of all these desirable things shall be introduced on purely hypothetical grounds, and because certain men have created in their minds an image of grim and amorphous form if these things are to be achieved by the gas industry making better use of its coal supplies. There have always been dreamers; and there always will be. But they must not wittingly be allowed to stop progress, or make this country the laughing-stock of others.

The development of the gas industry and its public service demand that the percentage of the heat of coal distributed as gas shall be increased; and the only way to do this is to go beyond the carbonization of coal, and to gasify the fixed carbon that remains as coke. In doing this, carbon monoxide in increased quantity must be produced. Before the war it was clear that in the making of gas a point had been reached at which the production of coke was exceeding the demand. Stocks of coke are again accumulating at an ugly rate; and this cannot go on without adversely affecting the price of gas. Gas is a fuel in greater (and increasing) request than is coke. Prof. J. W. Cobb spoke of these things when before the Carbon Monoxide Committee last Thursday; and he told them plainly (if not in these words) that what was being asked by those who sought limitation was the curtailment of the industry's gas-producing possibilities, and therefore public service. After listening to Prof. Cobb, the members of the Committee must have felt that their responsibility had not been lightened (though undoubtedly their task had) by this clear recital of the points bearing upon this particular economic issue.

These points can be marshalled quickly. The gasification of fixed carbon can be carried out with a higher efficiency of gas production than the carbonization process. Water-gas plant provides a very simple method of doing this. Its capital cost in relation to productive capacity is lower than carbonization plant; and its elasticity in operation enables it to meet flights in the demand for gas for heating in the winter time. No one who considers the economic prospects can suggest any carbon monoxide limit at the present time, because no one knows the economic limit to which gas production can be carried. There is steaming in continuous vertical retorts. Nobody yet knows the economic limit to which this can be extended. There are types of plant in existence and developments in sight for the complete gasification of coal. There are great possibilities here which are being narrowly watched by gas technicians. And Sir William Pearce was very much attracted by what Prof. Cobb told the Committee as to how, if oxygen is reduced sufficiently in price, complete gasification with a mixture of oxygen and steam will become a practical proposition. The Chairman was particularly keen to learn what, in the witness's view, is the likelihood of oxygen falling considerably in price; and the evidence is that it is not unpromising. However, it is seen that the whole trend of development in gas production is to the gasification of fixed carbon and the production of carbon monoxide in quantity; and the carbon monoxide is a valuable constituent of gas, especially in gases with a reduced content of methane and other hydrocarbons, because these lean gases would (as Prof. Cobb says) otherwise tend to have a high ignition velocity, and on that account be liable to strike-back in the burner. The radiating power of carbon monoxide and the long flame it produces are both useful properties. In short, carbon monoxide is a constituent of gas that should be welcomed, and not pilloried. Prof. Cobb's statement must have made fully clear to the Committee that limitation would be a discouragement to the gas industry, and that it would have most unfortunate effects.

The Committee had a mass of evidence before them at their two sittings last week; and the deeper it grows, the greater, it appears to us, are the difficulties of those who ask for restriction. The evidence given by Mr. Robert Mond, on behalf of the Fuel Economy Committee of the British Association, was not of the potent nature that might have been expected. He was there apparently through the enforced absence of Prof. Bone. The Committee may perhaps be described as chief instigators of the present inquiry; and they are asking that the technical future of the industry shall be converted into a *cul de sac* by the imposition of a minimum methane content of 20 p.ct., and a maximum carbon monoxide content of like amount. Yet Mr. Mond asked the Committee to believe that the British Association Committee had done their level-best to make suggestions which would not be too onerous on the gas undertakings. If this is so, then the members of the Committee who favour the suggested course (they do not all do so, and some of those who do are not qualified to express an opinion on the subject) are incapable of measuring the meaning of "onerous conditions" by practical considerations. Where especially their difficulty comes in is that postulation as to an increased risk is not borne out by the available evidence. The testimony of Mr. Stevenson Taylor, the Senior Engineering Inspector of Factories, can be ruled-out at once; for his statistics as to accidents and fatalities dealt with gases, uses, and conditions that have little or no relation to town gas, and its uses and conditions.

The degree of actual risk with town gas must be tested by experience under the conditions of its use; and the experience is that fatalities have not been augmented during the period of an increasing percentage of carbon monoxide, and an increasing use and application of town gas by the community. Figures were given by Dr. Stevenson, of the Registrar-General's Department. He took two classes of supplies—one containing a high proportion of carbon monoxide (20 p.ct. and over), and towns supplying a low proportion of carbon monoxide (6 to 8 p.ct.). The figures as to fatalities, Dr. Stevenson admitted, were extremely small—1·9 per million of the population in the low carbon monoxide areas, and 4·3 in the high carbon monoxide areas, and this was over a period of seven years. But it was elicited from Dr. Stevenson that these figures include coal gas and producer gas! He also agreed that gas was a very small cause of death. What are the Committee to make of such data? The only conclusion to be drawn is that, taking the worst conditions of producer gas and the more moderate conditions of town gas, even then the average number of deaths per unit of the population resulting from carbon

monoxide are (as Dr. Stevenson remarks) "very small" indeed. On this point there was also the remarkable evidence of Mr. F. W. Goodenough, who showed that, despite the enormous increase in consumption in the area of the Gas Light and Coke Company, there was a decrease in the number of accidents. The scale of such experience is not, the Committee must agree, a negligible quantity. The experience covers a diversity of conditions that can hardly be matched in any other gas-supply area in the world. The big increase in the demand for gas, too, shows its popularity; and the popularity is evidence that the public do not fear the risk that those profess who are showing such concern for them in relation to carbon monoxide in gas, but who make no movement in respect of greater dangers about us. Why? They may be left to answer for themselves. Again, Mr. Goodenough's evidence was proof that the public themselves afford the best possible security against the risk. The educational work of the British Commercial Gas Association, the spread of knowledge of gas through experience, the higher skill and improved work of gas-fitters, and the greater care in design and construction of gas appliances are the best of safeguards against the increasing percentage of carbon monoxide. There is greater security in all this than by reducing the proportion of such a valuable constituent of gas as carbon monoxide.

It was gratifying to hear the Chairman of the Committee say it could be taken that the Committee were in favour of not doing anything that would hinder the increased use of gas, provided there was no additional risk to the public. In this connection, there was a point made by Prof. Cobb which should be emphasized. It is that it would never do to draw any conclusion regarding a limit to carbon monoxide from the evidence as to its proportion in the gas produced by continuous vertical retorts with steaming. This is not universal practice; and it is not likely, though it will have a very considerable adoption, that it will become so. The question of future development of heat-unit production per ton of coal treated must be kept in view, and current practice must be regarded as only the point to which advance has been made to-day.

Coal and the End of March.

What is going to happen when financial decontrol of the coal industry comes in a fortnight's time? Every purchaser of coal would be glad to know the answer to the question. But from the speeches in the House on Tuesday evening, when second reading was given to the Government Bill providing for financial control to cease on March 31, and from what has since transpired, it is pretty clear that at the moment neither the coalowners nor the miners know. But with the surplus supplies of coal there have been about the country, gas and other works ought to be well stocked against any unpleasant eventualities, especially those who may get their coal from small mines that may have to be closed-down, because of there being no profit in the working of them. This seems unfortunately to be the condition under the present high costs of production of a good many of the collieries. An official statistical statement issued last week shows that of the ten districts into which the coalfields are grouped, only one (comprising Derby, Nottingham, and Leicester) is paying its way. The statement further demonstrates that the average net deficit per ton raised is 5s. 8½d., to which has to be added provision for depreciation, interest on debentures and other loans, capital adjustments under the Finance Act, and the profit to which the owners are entitled under the Coal Mines Emergency Act. Mr. Bridgeman told the House on Tuesday that, under present conditions, to subsidize the coal owners and miners, it is costing the country over 1 million pounds a week. We have only to multiply the 5s. 8½d. by a week's production to see that the million pounds is not an over-estimate. That is what the country has to pay, and that is why the Government want to put an end to the existing control conditions as speedily as possible. That is why, too, the coalowners and the miners did not want decontrol to end before August, as originally provided for in the Coal Mines Emergency Act. They preferred that the nation should pay as long as possible. But before the Decontrol Bill came up for second reading, the owners had decided not to oppose it, having been persuaded that there was no other course open to the Government in the present state of national finances. And while the miners did oppose in the House, and that strenuously, they had beforehand reluctantly come to the conclusion that this would be futile.

The Bill obtained second reading. But not before there had been impassioned speeches especially from the labour members, who foresee all sorts of calamitous things happening in a fortnight's time with the industry under financial decontrol. The miners will be thrown out of work by their hundreds of thousands—so it was said. This depends on circumstances, and the circumstances on the miners. The facts are that at present prices British coal cannot compete in the foreign markets, and yet there is going on a million pounds loss a week. This is not business; and it is the road to ruin. The owners realize that prices must come down; and with an average loss to-day of 5s. 8½d. per ton of coal, they also realize that the costs of production will have to be drastically curtailed. There is the rub. The miners' wages represent 78 to 80 p.ct. of the costs, and are the only part of the costs upon which a sufficient reduction can be made to have any effect in restoring the industry. The measure of the necessary wage reduction, too, depends upon the production per man. Between the taste for high wages fostered by the Miners' Federation, and the fate that awaits the coal industry if these high wages are not now brought down to a reasonable level in relation to production, the miners' leaders, it was seen before and during the debate in the House, find good reason for perturbation. The only choice is between greater unemployment and lower wages so as to create a competitive price for coal. Of this the leaders are fully conscious; so they are too of the fact—though they will not own up to it—that large responsibility rests upon them; and they would like to put off the day of reckoning by the Government's continuing the subsidy drawn from the pockets of the taxpayers. But now they know that their efforts in this direction have failed. They realize that all they can do is to make the best possible wages bargain with the coal owners; but whatever the bargain, it will not be satisfactory to men who not long since, through the fatuous policy of the Federation, were out on strike for higher pay. They still adhere to the settlement of the wages scheme on a national basis; the owners to a district basis. On this point one side or the other will have to bend. But while writing, what will happen in the industry in a fortnight's time is a mystery. All we do know is that there will be more unemployment if wages are not reduced, that the coal industry cannot continue to be run at a loss, and that prices must descend if this country is to re-enter lost foreign markets.

At the moment, however, the responsible advisers of the miners seem to be devoting themselves to a suicidal policy, which they must know will not succeed. We believe that they are simply playing for time in putting forward extravagant demands. A wage scheme which they adopted at a National Federation conference last Thursday proposes that the industry should be treated as one unit; that the wage of each grade of men should be of uniform amount, whatever the district, and independent of the economic position of the colliery at which a man is employed; that there shall be financial assistance from the pool to the older and weaker collieries; that the present wage be the future standard wage in the industry—all present percentages being merged in the standard, and the war and Sankey wages of 5s. per day to be added to the standard wage; that the standard wage be counted as the first charge upon production, and be paid before any profit is allowed to the owners; and that the owners' minimum profit be one-tenth of the amount paid in wages. The proposal with regard to wages is a pretty tall order. It means that to the very last halfpenny the men receive now, they shall receive in future as their standard wage. This is only fooling with a serious position. If we were to believe that the miners' leaders were fully convinced that the future standard wages of the men should be what they are now asking, then it would be clear that they are either devoid of understanding or that they want to bring in full force catastrophe upon the industry for some ulterior motive. Both the owners and the miners had interviews with the President of the Board of Trade last Friday as to the differences between them upon the wages scheme; and he indicated to them the possibilities of coming to some compromise. More will be heard of this during the present week.

We also see that the Federation of British Industries, at a conference at which the National Gas Council was represented, have registered their opposition to the treatment of the wages question on a national basis with the provision of a pool, as well as their view that there can be no revival in trade and employment until coal prices have been substantially reduced.

A Line of Demarcation.

Can a line of commercial demarcation be drawn for the gas and electricity industries? That is the question we asked ourselves after reading the report (published to-day) of a discussion at a meeting of the National Association of Supervising Electricians. The gas side was upheld by Mr. F. W. Goodenough and Mr. W. M. Mason; and Mr. W. A. Gillott was the chief of several speakers for electricity. We cannot say that either side did much to convert to its ideas the other side. If impression was made, it is kept concealed; but at the same time such discussions are not altogether useless, as they do, we believe, help to engender greater respect through the better understanding of each other's point of view. But the question attracting us at the moment is the one put forward by Mr. Goodenough: "Why not face facts all round, and concentrate on each side "on really profitable business rather than waste a good deal "of time and energy in trying to hurt your competitor with-"out profit to yourselves?" In the first place, who is going to peg-out the respective claims? We shall never get the electrical men into such a frame of mind that they will unanimously say that anything they do is unprofitable. We gas men may have our views on the subject; but to try to get the electrical men to adopt these views would be, as in the past, an altogether unprofitable venture. And the same when the boot is on the other leg. What is there in all that the gas industry does in the way of trading that it would readily give up as being unprofitable? As a matter of fact, in asking electrical men to abandon their campaign in the cooking and heating field, we are asking them to relinquish something for which we have nothing to give in return. For there is not a single line of present gas activity to which gas has not a legitimate claim. We know that, applying the thermal test, electricity has no legitimate claim (other than for special purposes) to heating; and there is precious little cooking that it can do economically, having regard to the low efficiency of electricity generation, and, in service, particularly of the hot-plate. Even so, electrical people are not prepared to give up hope, shadowy as it may be. Personally, we do not want them to. Their competitive efforts are a stimulus to the gas-supply industry and to gas invention. This is worth something. Where is the dividing-line between the two industries? asked Mr. Gillott. It would be difficult to say exactly. We, as interested parties, could draw a rough line; but there is confidence the two industries would never arrive at a definite compact on the subject. In our opinion, the gas industry can safely leave the public to draw the line of demarcation. It may be a wasteful way. But people learn by experience; and it is a human idiosyncrasy to pay dearly for it.

Thermal Efficiencies in Gas-Works.

In the paragraph under this heading last week reference was made to the extent of chemical control and waste-heat utilization that is being introduced into carbonization practices on the Continent; and a description of what is being done in connection with the Woodall-Duckham installation at Dresden was referred to as an illustration. The retention in the paragraph of that allusion to the Dresden plant was an oversight, as it was found necessary to defer the publication of the article with its several interesting views of the plant. However, it appears to-day; and so the remarks of last week will now apply.

Railway Traffic Uncertainties.

As in coal, so in traffic, the gas industry has a large interest. A considerable part of its 20 million tons of coal each year goes by rail, and so do the other materials it uses, as well as the new plant and apparatus it buys. The future of the railways and their rates is at the moment as obfuscated as is the coal position. Under their agreement with the companies, the liability of the Government for the ten months ending with January amounts to £36,323,767; and trade depression has brought about a diminished revenue from the carrying of goods. Expenditure, fortunately, has been reduced; and this will continue with wages subject to reduction in defined proportion to the receding of the cost of living. Control comes to an end this year; and the position looks financially very threatening. All sorts of schemes for the future are being considered—schemes for effecting economy, and some of which professional railwaymen look upon with contempt as being the impracticable products of theorists. There is no sign of any general agreement over an acceptable scheme to do anything that will raise efficiency and economy. The Government grouping scheme is being dissented from by certain important elements. The liabilities that have been incurred by the Government are the subject of grave dispute. And labour is wanting a voice in the direction of the companies, which the Directors are not disposed to concede. The position is chaotic; the outlook not bright.

Coal and Slack.

The coal output for the week ending Feb. 26 was 4,321,400 tons; for the week ending Feb. 19, it was 4,284,100 tons; and in the previous week, 4,345,400 tons. This shows that there is no improvement in the number of mines at work or in the men employed. It is not likely that there will be improvement while the present trade depression lasts, and the prohibitive price of coal continues to exercise its influence in lowering our industrial competitive position. A Midland coal owner states that the greatest drug on the market to-day is small coal or slack, owing to the industrial depression; and the position is aggravated by the substitution by the Miners' Federation of the shovel for the fork in the stalls, with the result that dirt and slack are placed together in the tubs. This naturally renders the slack less acceptable for boiler purposes. At the colliery with which this owner is associated, there are 620 wagons full of slack waiting for orders, and on the ground there are 4500 tons of slack. Yet the Federation are proposing the continuation of a policy which means suicide, in order to retain the present high rate of wages. We see that Mr. Robert Smillie has, on account of continued ill-health, finally resigned his presidency of the Federation, and it has been accepted.

Depreciation Allowance and Contract Prices.

The minutes (published this week) of the Central Executive Board of the National Gas Council are full of interesting, if not altogether pleasing, points. Gas undertakings will be sorry to lose the 50 p.ct. increase in the depreciation allowance on gasholders, meters, and cookers for income-tax purposes. We fail to see that conditions yet exist which justify its refusal. But the Inland Revenue Authorities, it seems, have now resolved to discontinue it, though willing to consider any case in which the administrators of an undertaking are of opinion it is not receiving fair treatment. Then again the intricacies of the matters surrounding contract prices have opposed the endeavours to find a definite method of applying to contracts a sliding-scale clause governed by the costs of materials and labour. It is felt by the Society that it is a matter for individual arrangement between a contractor and a gas undertaking as to whether tenders should be on a sliding-scale or firm basis for the next six months. The Central Executive Board of the National Gas Council have decided that for the present these questions should be dealt with between the contractors and gas undertakings. If any difficulty is experienced in arriving at an amicable settlement, the Council promise to take up the matter with the Society.

May Meeting of the Institution of Gas Engineers.

The annual general meeting of the Institution of Gas Engineers will be held at the Institution of Civil Engineers, Great George Street, S.W., on May 24, 25, and 26, under the presidency of Mr. Thomas Goulden, M.Inst.C.E. (Chief Engineer to the Gas Light and Coke Company), and will conclude with a visit to the Beckton works. On the opening morning, there will be a welcome to the President (M. Ed. Kaeuffer) and members of the Société Technique de l'Industrie du Gaz en France; and in the evening of that day there is to be a reception and dance by invitation of the President and Mrs. Goulden at the Royal Institute of Painters in Water Colours, Piccadilly.

The joint visit of the Eastern and Western Districts of the Scottish Junior Gas Association to the Granton Gas-Works will take place on Saturday, the 26th inst., instead of the 19th, as previously arranged.

After pneumatic gas switches have been in use for some time, the pneumatically operated gas cut-off sometimes leaks slightly. When this cannot be remedied by cleaning alone, a little glycerine, smeared over the piston, will effectively stop the leak without interfering with the working of the switch. Oil or grease is unsuitable, as the resistance is often too great to prevent the cut-off working by pneumatic pressure, particularly if the burner is at all hot.

OBITUARY.

LORD MOULTON.

The news came as a great shock last Wednesday afternoon that the Right Hon. Lord Moulton, K.C.B., G.B.E., F.R.S., had been found dead in bed that morning at his residence in Onslow Square. On the previous day he had been at work in the House of Lords, and returned home apparently in his usual health.

Lord Moulton was born in 1844, and, after a brilliant career at college—being Senior Wrangler and First Smith's Prizeman in 1868—was called to the Bar at the Middle Temple (of which he was a Bencher) in 1874, and took silk in 1885. Conspicuous features of the legal career of Mr. J. Fletcher Moulton, K.C. (which was largely devoted to patent cases) were his conduct of the Welsbach litigation and the case for the Metropolitan Water Board in the arbitration proceedings connected with the transfer of the Companies' undertakings. Throughout, his great scientific knowledge proved of enormous assistance to him. In 1906 he was appointed as one of the Lord Justices of Appeal. He was then knighted, and in 1912 was raised to the peerage, and made a Lord of Appeal in Ordinary and a member of the Judicial Committee of the Privy Council. For some years previous to his elevation to the Bench he sat in Parliament.

From a national point of view, the years of Lord Moulton's life which will no doubt always stand out are those he so wholeheartedly devoted to the service of the country during the war. His active association with explosives through those terrible years began towards the end of 1914, when he became Chairman of a Committee; and in the following year, when the Ministry of Munitions was formed he became Director-General of Explosive Supplies. At the time when the war broke out, the recognized high explosive was picric acid, though trinitrotoluene ("T.N.T.") had just been adapted to the purpose. For the latter, as all "Journal" readers are well aware, the demand grew and grew; and it was in this connection that the help of the gas industry became of vital importance, Then it was recognized that a very powerful explosive might be made by mixing with "T.N.T." ammonium nitrate; and Lord Moulton appreciated the value of the mixture.

In 1917, after having been nominated as an honorary member of the Institution of Gas Engineers, he was asked to accept the presidency of the Institution for the year 1917-18. The Council rightly felt that his nomination to this position would be received throughout the gas engineering profession and industry with the warmest approbation, when it was remembered that, as Director-General of Explosives Supply, he had taken the leading part in the organization and administration of a department the results of the work of which were evident soon after its formation, and which increased in importance as time went on. In accepting the position, Lord Moulton laid emphasis on the fact that the assistance rendered him in his arduous task by the gas industry had been of the highest service to the State, and of incalculable value to the success of the Allied arms. To use his own words to the members at the annual meeting in June, 1917: "I think you are entitled to point out to the world how much, and in what way, the country is indebted to your industry for its safety in this war." His address to the Institution in the following year was a memorable one, and one which laid not only the members, but the gas industry generally, under a deep debt of gratitude to the President. It was calculated in the highest degree to stimulate both thought and enthusiasm.

In 1918, also, Lord Moulton was elected President of the Society of British Gas Industries and of the Association of British Chemical Manufacturers; and he occupied a similar position in connection with the British Commercial Gas Association in 1919, when he showed himself to possess a thorough grasp of the business side of the industry, in the welfare of which he took so keen an interest. The re-establishment of the dye industry in this country was a matter in which he took active concern, being for a time Chairman of the British Dyestuffs Corporation, after its formation in 1919.

After the armistice, a personal letter of thanks was addressed by Lord Moulton to gas engineers which may be quoted here as a typical instance of his generous acknowledgment of the help afforded by the industry during the time of stress: "Now that it has become no longer necessary for me to call upon the gas industry for the supply of raw materials for the manufacture of explosives, I desire to express my warm thanks to you and your staff for the keen co-operation with which you have worked with my department during the war. Not only has that help been of incalculable value, but in spite of innumerable difficulties it has been forthcoming with a readiness which could not possibly have been given were it not for the great issue at stake, to the success of which you have all so splendidly contributed. I am satisfied that the effort you have made will ever be a source of satisfaction to you, as it will always be remembered with appreciation by myself."

A year ago, he returned to his judicial duties in the House of Lords; and last July we had the pleasure of recording the fact that at a dinner of British chemists and chemical manufacturers, he was the recipient of a piece of silver plate in recognition of his eminent services as Director-General of Explosive Supplies. It was then announced that an appeal was about to be issued, under his leadership, to provide funds for the erection of a central headquarters to house all the various chemical interests—scientific, technical, and commercial.

He was a Fellow of the Royal Society; and both Cambridge and Edinburgh Universities conferred their honorary degrees of LL.D. upon him. For many years he was a member of the Senate of the University of London, and was honoured by the French distinction of Commandeur de la Légion d' Honneur, and the Belgian decoration of Commander of the Order of Leopold. For the session 1903-4, he was President of the Institution of Junior Engineers. His name was included in the list of Vice-Presidents of the Royal Institution for the year 1914.

The death of another old gas man has regretfully to be recorded—Mr. William M'Intosh Airth (the father of Mr. George Airth, of Dundalk) having passed away on the 3rd inst., at his residence in North Ormesby, Middlesbrough. Mr. Airth, who was a native of Arbroath, was educated at the high school of that town, from which he was indentured at the Arbroath Gas-Works, under Mr. Brown, who was then the Engineer and Manager to the Corporation. His first appointment was as Assistant at the Maidstone Gas-Works; and he went from there to Lochgilphead. The Cleator Moor Gas-Works were built under his superintendence about 1873; and after that he was Manager at Kirkby Lonsdale, going from there to the Millom Gas-Works. He was appointed to the Morpeth Gas-Works in 1887, and retired on pension in 1904. Mr. Airth was an ardent freemason, and W.M. of Lodge De Ogle, No. 656, in 1896-7. He was buried in North Ormesby Cemetery on the 7th inst.

The death took place on Friday last, the 11th inst., of Mr. Charles Silburn Barber, who was for the long period of nearly forty years Secretary to the Davis Gas-Stove Company, Ltd. He was made a Director of the Company, and retired in 1913 on a pension.

In their report to the shareholders for the past half year, the Directors of the Cork Consumers' Gas Company announce with regret the death of the Secretary, Mr. John S. O'Mahony.

PERSONAL.

Mr. Harold E. Copp was elected a member of the Institution of Civil Engineers at the meeting on the 8th inst.

Mr. T. Maule Guthrie, J.P., the Chairman of the Brechin Gas Company, Ltd., has been unanimously adopted as the Liberal candidate for Moray and Nairn, in succession to his cousin, Sir Archibald Williamson, who is retiring at the end of the present Parliament. Mr. Guthrie is a son of the late Mr. James Guthrie, of Brechin, and a grandson of the eminent Free Churchman, the late Dr. Guthrie, of Edinburgh, who founded the Ragged Schools. He is a solicitor and banker in Brechin, besides being interested in different industrial concerns. He takes a keen interest in everything pertaining to the gas industry.

The question of a successor to Mr. W. M. Valon was considered at a meeting of the Stafford Town Council last week; Mr. T. H. Poulson being appointed Engineer of the gas-works, of which since 1914 he has been Chief Assistant Engineer. The salary was fixed at £650 for the first year, rising by annual increments of £50 to a maximum of £800.

It is announced that Mr. F. Shewring, who went from Droitwich to Pontardawe some five years ago, has been appointed Engineer and Manager of the Stratford-on-Avon Gas-Works. He will succeed Mr. T. H. Beaumont, who goes to Horley.

It is with regret that we learn of the serious illness of Mr. Robert Porter, who has been Engineer and General Manager to the Elland-cum-Greetland Gas Company for more than 32 years. He has been suffering from a serious malady for over five years, and, as complications may arise, has been advised by Sir Berkeley Moynihan, of Leeds, to go into one of his nursing homes for two operations in the early part of this week. Mr. Porter's many activities bring him constantly in touch with numerous members of the gas profession, as he is Managing-Director of the Royston (Yorks) and District Gas Company, Ltd., the Hemsworth, Grimethorpe, and District Gas Company, Ltd., the Kippax and District Gas Company, Ltd., the South Elmsall, South Kirkby, and North Elmsall Gas Company, the Great Ayton Gas and Water Company, Ltd., the Cowdenbeath Gas Company, Ltd., the Thurso and North of Scotland Gas Corporation, Ltd., the Kennoway and Windygates Gas Company, Ltd., and the Largo and Lundin Links Gas Company, Ltd., besides being Consulting Engineer to several other gas undertakings.

Mr. E. W. Wilson has been appointed Manager of their gas-works by the Swadlincote Urban District Council Lighting and Water Committee. He succeeds Mr. F. Robinson, who has been presented by the staff and workmen with a smoker's cabinet and gold-mounted amber cigarette holder.

Among the last-elected members of the Society of Chemical Industry are Mr. Henry P. Lupton, Chemical Supervisor to the Liverpool Gas Company; Mr. Sydney Smith, Gas Engineer, of Bristol; Mr. T. H. Williams, Gas-Works Engineer, of Crewe; and Mr. Roy G. Parsons, Manager of the Footscray (Victoria) works of the Colonial Gas Association.

THE GAS INDUSTRY ON THE HEAT-UNIT BASIS.

Special Articles.—XI.

THE contribution this week ends this series of special articles. It is by Dr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company; and he has written the article to the title that was suggested by us—"Why I Abandoned the Sliding-Scale?" Actually it was the Company (on the advice of the Directors) who legislatively abandoned the sliding-scale, and adopted a new system for dealing with profits. But this is one of the things where there has to be a place of conception and inception; and that place was, we know, the brain of Dr. Carpenter. Hence the personal character of the title.

WHY I ABANDONED THE SLIDING-SCALE?

By Dr. CHARLES CARPENTER, M.Inst.C.E.

YOU have asked me to contribute to the columns of the "JOURNAL" a statement explanatory of the reasons which led to the abandonment by the South Metropolitan Gas Company of the sliding-scale so long associated with gas politics generally and its own in particular. I willingly accede, for the reason prompting the request—namely, that the statement may be found useful to others who, like myself, bear the responsibility of conducting gas undertakings under company law, as modified by special statutes. Besides, I cannot believe it will be a good thing for the gas industry to be indefinitely fettered by the financial restrictions handed on by the Gas Regulation Act, though I whole-heartedly approve of the technical guidance and direction this will provide. No chemical manufacturer has other than good to say of the Alkali Works Regulation Act, as administered by the Chief Inspector and his able assistants appointed under it. I believe the corresponding part, as we may call it, of the Gas Regulation Act will be made an equally useful piece of machinery to the manufacturers of gas long after the opposition to its essential principles has died away.

HISTORY EXAMINED.

In order to appreciate the reasons which led to the domination of the gas industry by sliding-scale conditions, it is necessary to reconstitute the relative history of the past century of gas lighting; and, at the outset, we cannot but be struck with the fact that for the first forty years of its existence the industry had a more or less free-run before it was brought, in 1847, under the general regulations of the Gas-Works Clauses Act. That measure, as everybody knows, placed upon undertakings working under it the limiting provisions of 10 p.ct. maximum dividends; and, with little modification, these provisions continued in force for practically the next thirty years. These years were by no means uneventful; and for much of that period gas supply was one of those burning questions always to be depended upon to furnish useful weapons for virtuous vestrymen and polemical politicians. It must be said of the gas undertakings of the day that they were generally to the fore in providing suitable targets for the missiles of their critics. Perhaps the best example of this was their attitude in the matter of the various coal strikes, the whole cost of which was, generally speaking, transferred by the companies to their consumers. The notable exception was that of the one then managed by George Livesey, who, with his relatives, had a considerable financial interest therein—namely, the South Metropolitan Company. Of all the undertakings south of the Thames, fate had decided that it should be the least favourably situated. Its district was largely built-over; and all its coal was brought by ships into the Surrey Docks, unloaded by the Dock Company into barges, which were then towed by horse up the Surrey Canal to the Old Kent Road works. Now Livesey was not only an able engineer, but he was also a cute business man, and he loved a bargain. He would have held his own in any Lancashire or Yorkshire town with the spinners and weavers, had he been one of them; while he would have taken hardly less delight in devoting himself after "change" to improvements in the machinery of the mills. One can imagine his thoughts about the neighbouring gas undertakings in South London (all with works on the Thames), the most important with facilities for unloading their own ships and possessing likewise large undeveloped tracts in their areas of supply. And, moreover, the shareholders in his Company drew no more dividend than those in the less commercially conducted adjoining undertakings. He was quick to realize the incentive to economical management provided by the authority to pay increments of dividend over and above the standard of 10 p.ct. There is no doubt a great step forward was taken in the interests of progress in Metropolitan gas supply when a few years later these adjacent undertakings were brought under his control. In those days gas supply was indeed a monopoly. The Jablochkov candle had not illuminated the Thames Embankment; while it was still something of a favour, hedged round with conditions in most cases, for a new consumer to become connected with the gas company's mains.

SLIDING-SCALE NO REMEDY AGAINST BAD MANAGEMENT.

It must be confessed that the original South Metropolitan shareholders had the best of the amalgamation deal, for, by what was known as a domestic arrangement between them and those in the other companies taken over, the sliding-scale increment was so apportioned that they received the lion's share. They really deserved it; and the bargain was no less a good one for the gas consumers in the entire area thus brought under Livesey's management. On the other side of the Thames, Mr. Harry Jones was carrying on the Commercial Company, also under sliding-scale conditions. In both their areas of supply, confidence existed between the undertaking and the local authorities. But it would be a mistake to suppose that the advent of the sliding-scale brought peace in regard to Metropolitan gas supply. Not very many years afterwards the largest of the three London Companies found itself at the bar of a Select Committee of the House of Commons to answer charges of mismanagement which were widespread and deep-rooted. And, notwithstanding that it was working under the sliding-scale, it was found by the Committee that the affairs of the Company were not well managed, and that the incentive of the scale to ensure that the business was managed with "due care and management" had not been realized. In other words, a sliding-scale is a useless remedy against bad management. It was realized later that it might become a heavy hardship to good management. Livesey had himself some misgiving that all was not well, when, in the last few years of his life, he struggled in vain against rising coal costs which threatened to undo some of his many years of labour for low-priced gas. Except perhaps during the Boer war, the sliding-scale was not subjected to a real test of its soundness in the whole of the forty years of its pre-war existence. It succeeded as it did because it was called upon to do so little.

GENESIS OF A NEW OPINION.

The truth began slowly to dawn upon me soon after I took over the reins of management on Livesey's death. I had had a not-unimportant share in reconstructing the general management from that of a monopoly to an up-to-date business organization, with research laboratories at one end of the scale and gas salesmanship at the other. Yet the reward to capital did not increase, in spite of enormously extended endeavours in all directions. The simplest remedy would have been, of course, to apply for an increase in the standard price—a plan followed later as a war-time expedient. At the same time it became increasingly evident that the whole basis of selling gas left much to be desired; and I drew attention to it in the lecture I had the honour to give in 1914 before the Institution of Gas Engineers. Then came the war; and it was clear that one course only lay open, and that was to "carry on" as far as possible, and leave the problem of re-settlement as one of the post-war tasks.

CONSIDERATIONS LEADING UP TO THE NEW BASIS.

Two circumstances helped to crystallize-out the idea of a new basis of working. One of these was some information I had as to the working of a sliding-scale company which deliberated between extending its business and lowering the price of gas. Only the latter happening affected its dividend, and more business might mean, under the sliding-scale, increased anxiety with no greater remuneration. The other impressive point was the fact that the gas consumer had an undue preference as regards the price he paid during war conditions, while the shareholder was placed at an unfair disadvantage. As a result, one was forced to the conclusion that no resettlement would be satisfactory which did not provide against the unfair treatment of the shareholder. Still another factor came into consideration—namely, the position of the co-partners under the sliding-scale. In order to patch-up this defect, arbitrary scales were introduced by some co-partnership companies, with a view to giving the workers something in the way of bonus. But this always appeared to me an unfair proceeding, since it placed co-partners in a preferential position by allocating to them profits denied to the ordinary shareholders. In the long-run, it was clear that such opportunism would not eventually be conducive to the strength of co-partnership. A still further factor had to be reckoned with—namely, the inequality of the effect on shareholders and co-partners respectively of simply increasing the standard price of gas as providing a new basis.

THE NEW SYSTEM OF PROFIT DIVISION.

All these difficulties pointed to the need of an entirely fresh system of working; and this, with the aid of a sympathetic and intelligent staff, was eventually evolved. Now the foundation of this new system lies in the recognition of three factors:

1. That the consumer is entitled to buy at a fair price.
2. That labour is entitled to a fair wage.
3. That capital is entitled to fair remuneration for its use or investment.

The principle in relation to (1) and (2) has been over-and-over

again affirmed in legislative proposals; but the South Metropolitan Gas Act was the first to secure its application to capital. The standard rates for present and future capital have been definitely fixed, and are not at the mercy of any official or department. If the future brings with it need for revision of the basic price, this revision will in no way apply to the capital rates which have been recognized as being outside the domain of profits—just as labour's rates are outside the variations due to profits. The consumer is protected, while capital and labour are encouraged to join forces and put out their best efforts in their mutual interest. The gas consumer never understood the sliding-scale—an ignorance that is shared by many official minds. But he can understand the fixing of a fair (or basic) price for the commodity he purchases; and he can understand that, if conditions improve, he takes three-fourths of the profit, and capital and labour the remainder, equally between them. Why should the gas industry be singled-out for the antiquated fetters of sliding-scales? Is it not high-time that a closer approximation in the conduct of its operations should be possible to that usual in other industries, with but the one additional factor of fixing a basic price? Moreover, the gas shareholder has had an unpleasant experience during the past few years. Will he be re-assured by being informed that he is to have another sliding-scale? Is it not possible that he finds he has had enough of them, and asks why this special treatment is meted-out in respect only of gas capital? It is my opinion that the sliding-scale has had its day, and that the time is ripe for adopting a new conception of the mutual obligations of industry (in the widest sense of the word) to consumer, shareholder, and employee.

An Innovation of Far-Reaching Importance.

I have confidence that this era, successfully inaugurated under the powers of the South Metropolitan Gas Act of 1920, will be of far-reaching importance, not only to those concerned with the supply of gas, but to all industries the successful conduct of which is of supreme importance to the State. It already looks as if the innovation is bearing fruit in the discussions taking place on the reconstitution of the mining industry.

"Modern Coking Practice."—We have received for review a copy of the third edition, enlarged, in two volumes, of "Modern Coking Practice," by Mr. J. E. Christopher, including the "Analysis of Materials and Products," by Mr. T. H. Byron. Vol. I. deals with "Raw Materials and Coke," and Vol. II. with "Bye-Products." Details of the most recent designs and methods are given in the form of appendixes to each volume. Messrs. Crosby Lockwood and Son, of Stationers' Hall Court, E.C., are the publishers; and the price per volume is 10s. 6d. net.

"B.C.G.A." District Conferences.—Three District Conferences to be held in the immediate future are announced by the British Commercial Gas Association: Manchester District (at the Town Hall, Bolton), on March 18; Southern District (at the Spa Hotel, Tunbridge Wells), on March 31; and South-Western District (at the Gas Offices, Torquay), on April 4. Housing questions, the development of coke sales, and the therm basis of charge are among the questions to be discussed; and at each conference Dr. C. W. Saleeby will lecture on coal smoke. These are live subjects, which should ensure successful conferences.

Reducing Total Sulphur in Gas.—Results of extensive tests carried out by Mr. U. O. Hutton and Prof. C. C. Thomas, in collaboration with chemists of the United States Bureau of Mines, go to show, according to the investigators, three methods whereby to reduce the total sulphur in gas—low temperatures, larger charges, and liming the coal. The first of these, they say, is incompatible with the economical operation of a gas plant. As to the second, there is no good reason in evidence why retorts should not at all times be charged to their maximum capacity. Coming to the third method, they remark that liming the coal is not looked upon with much favour in America; but they point to the Cheltenham plant in this country as having been operated for a number of years on these lines—with a reported increase in ammonia yield, as well as a reduction in sulphur compounds—which "two factors should help outweigh the cost of lime and the detriment to the coke."

Alcohol from Coke-Oven Gas.—At Middlesbrough, under the joint auspices of the Cleveland Institute of Engineers and the Society of Chemical Industry, Mr. Cecil F. Tidman, of the Skinningrove Iron Company, read a paper on extracting alcohol from coke-oven gas. He observed that it had been established at Skinningrove that alcohol can be obtained from coke-oven gas. A quantity of the spirit produced had been tried in tests on a motor cycle. Using a "Triumph" motor cycle, with nothing more than what could be termed roadside adjustments, the following results were obtained: No. 1 Shell spirit, 64 miles per gallon; 50 p.ct. alcohol and 50 p.ct. benzole, 78·5 miles; 75 p.ct. alcohol and 25 p.ct. benzole, 74 miles. It was possible to obtain more than 1·6 gallons of alcohol per ton of coal carbonized, which meant something like 10,000 gallons per week of alcohol from a carbonizing plant of 120 ovens. Work was still being carried on with a view to increasing the yield of alcohol, so that the whole of the benzole could be used up in the form of a 75 p.ct. alcohol and 25 p.ct. benzole mixture. During the discussion, it was contended that Government assistance should be given to the research carried out at the Skinningrove works.

ELECTRICITY SUPPLY MEMORANDA.

The agitation at Kingston-on-Thames against the retrospective increase of charge on electricity by 50 p.ct. as from Sept. 30 last does not abate. We hope it will continue until it is known under what powers the Electricity Commissioners thought fit to date-back the increase. We have our own views as to consumers being the proper persons to pay all the expenses of the service which they have rendered to them, and not have part of the costs paid by people who have not used the current, and who never had any real hand in putting the electricity concern into the possession and under the administration of the municipal authority. The point that requires clearing-up is as to whether the Electricity Commissioners have the power to make the increase retrospective? As we have said before, we know of no Act that confers upon them any such power. The position is that until a new Order is made, the maximum price authorized by an Order or an Act cannot be exceeded. Therefore, it appears to us that the legal maximum which could be enforced until the date of the new Order by the Electricity Commissioners is the pre-existing maximum. We take it that the Commissioners acted under the Statutory Undertakings (Temporary Increase of Charges) Act, which provides that "no modification shall be authorized which will increase the statutory maximum charge by more than 50 p.ct., or which is more than sufficient, so far as can be estimated, to enable the undertaking to be carried on without loss." There is no mention there of power to vary the charge restrospectively. And, as a matter of fact, the notice of the application, which sought an increase of the maximum price by 50 p.ct.—from 8d. to 1s.—was not published until Oct. 23; and the Order of the Commissioners was not made for some time after. Until an Order is made, the statutory maximum charge must continue. The statutory maximum charge at Kingston was 8d. until the very day the Order of the Commissioners was issued, and therefore the legal maximum charge during the whole of the time.

The Retrospective Charge.

Is it Just and Reasonable?

There is a loophole for the Commissioners. They may, "if they think fit, by Order provide for the modification of any statutory provisions regulating the charges to be made by the undertakers, and of any statutory provisions consequential on, or supplemental to, any such provisions as aforesaid, for such period during the continuance of this Act, in such manner, and subject to such conditions, *as appear to the Department to be just and reasonable*." There are very large powers in these innocent looking words. But we doubt very much whether the Legislature ever contemplated a retrospective charge as being "just and reasonable." If the Commissioners have power to make a retrospective charge for three months, why not for twelve? Some people might say that would not be just and reasonable; but we see no reason why Commissioners who make a charge retrospective for three months should not regard as equally "just and reasonable" a retrospective charge for twelve months. It is only a question of degree. The Kingston electricity consumers do not consider as just and reasonable a condition which puts up the price of current after it has been purchased and consumed under the old law. The whole thing is an infraction of commercial principles and right dealing between buyer and seller; and we cannot understand the Electricity Commissioners making themselves parties to such a piece of unfairness. There is something disingenuous about it; and that is why we cannot believe the Legislature would describe such an action as "just and reasonable." It appears to be very unjust and unreasonable to alter a statutory charge without notice. There is a feeling in the borough that the matter should be contested; and some of the leaders in the movement against the retrospective addition are talking of refusing to pay it, and so forcing the Corporation to bring the issue before the Courts. The Middle Class Union have been active in obtaining signatures to a protest against the retrospective increase. In the Union we take it there are ratepayers who are not electricity consumers. We wonder whether they have noted that, if the money is not got from the people who have used the current, it will have to come from the pockets of the ratepayers.

Extensions for Nothing.

There must be something wrong about the calculations of those electrical engineers who hesitate to make works extensions just now. The writer of "Flotsam and Jetsam" in the "Hastings and St. Leonards Observer" knows better than they. Under certain conditions—such conditions as exist at the Hastings generating station—even at the present prices of plant and labour, large extensions of works, costing £51,000, can be carried out, and the whole of the interest and repayment charges can be met by the saving on fuel alone, which saving would represent about £5000 a year. This, says the writer, is the estimate of Mr. Russel Ferguson, the Borough Electrical Engineer. It certainly looks wonderfully attractive. But, if true, it shows that the expenditure of fuel at the present generating station must be pretty heavy. Unfortunately, these things do not always work out according to estimate. No doubt

when Hastings took over the electricity supply undertaking, it was estimated that the town would reap a rich harvest of profit; but the real harvest it has reaped has been one of deficits, which the ratepayers have had to make up. However, by having on paper wiped-off all the interest and repayment charges by savings in fuel costs, the writer in the "Observer" has disposed of an item that represents a very large proportion of the total cost of producing electricity. That, however, is not all. The extensions would enable the undertaking to increase its supply by 50 p.ct.; and there is "no doubt" that a handsome profit would be realized from additional supplies. Much the same kind of thing has been said before. It is no use, however, trying to boost-up the ratepayers' favour on the side of new heavy capital expenditure at this time by such unproved paper calculations, and by pointing to a profit of some £3551 for a single year, when the aggregate of the deficits on this ill-fated concern has been ten times that sum.

Percentage Price Increase.

In passing, remarks this "educator" of public opinion on electrical matters, it is interesting to note that, while the price of gas has gone up 117 p.ct., the price of electricity has only increased by 50 p.ct. If the price of electricity had always been sufficient to have covered all the financial obligations of the undertaking, it would have been higher than it is and has been, instead of robbing the ratepayers who are not electricity consumers in order to pay costs incurred on behalf of those who are. Another thing is that the writer is setting incomparables one against the other. Capital charges are the heaviest item in electricity supply costs (it may be 50 p.ct.); production, distribution, and other costs, are the constituents of the balance. In gas supply, coal, oil, and labour are the heaviest costs; and coal, oil, and labour expenses are the ones that have made the greatest flights. Then again, if the writer in the "Observer" will only calculate the cost of electricity as compared with gas on the lighting and heating basis—that is to say, on the basis of costs for equal amounts of light and heat—he will find that electricity outstrips gas in cost in a manner which makes his reference to the 50 p.ct. increase, and all that is based upon it, look very ridiculous. If he would like to know more on this point, he had better consult Mr. Ferguson to help to make up a case for him; and if he will publish what he learns from Mr. Ferguson, we shall be very happy to discuss all he submits. Meantime, we would ask him not to base too great hopes on the £50,000 capital expenditure saving £5000 on fuel costs alone. It is a little bit dangerous. The sum of the deficits at Hastings should suggest caution, and not too great credulity.

Electrical Veracity!

Some of the readers of the "Sunday Observer" did not approve of the views [referred to in the "Memoranda" last week] of its Medical Correspondent on the subject of the physiological aspect of heating, and the cost of heating by electricity—a cost which appears to have made a very heavy drain upon his pocket. One letter writer commenting upon the article tries to put in a good word for electricity, and either makes a blunder or tells a deliberate falsehood. He says that the price of electricity for heating and cooking in London varies from about 1d. to 4d. per unit; and adds that "at the higher rates it is as expensive as gas for continuous use." That is true; it is as expensive and a great deal more so at any of the rates. It is so easy to prove this, that it would be a simple matter to show the writer of the letter how profound is his ignorance of the subject. And that is not the only stupid piece of fiction in his letter. Another writer thinks that the Medical Correspondent is badly at fault with regard to the financial aspect of electric heating. For this purpose, the writer states, the price rarely exceeds 3d. per unit, and to large consumers it drops to 2½d., and even less. He asserts that he has several rooms where it is possible to maintain a regular warmth at a cost of about 3d. per hour—that is, one unit. For a ten-hour day this would be 2s. 6d. But these must surely be extraordinarily small rooms or the atmospheric temperature must be fairly high, as a unit of electricity per hour will not on a cold day go far in maintaining the temperature of a room of any decent size—that is, applying the theoretical laws of the electric heating experts, which generally err on the low side, and have to be amended upwardly according to the outside temperature, and the construction, and position of the room. We read further: "If as a medical man he [the Medical Correspondent] prefers the heated and vitiated atmosphere, the consequent headaches, the noise, smell, and dirt of a gas-fire, then his views are far different from those of the great majority of his respected profession." Is this how the electric heating advocates are trying to fatten the business? The great majority of the "respected profession" in London are users of gas-fires; and they do not employ them because of the "vitiated atmosphere, headaches, noise, smell, and dirt." Electricity will not gain much by such egregious foolishness.

Theoretical Heating Calculations.

Mr. F. S. Grogan again comes forward with an article in the "Electrical Times." He deals with his own subject, "Electrical Heating and Cooking." The article is largely of the theoretical brand; and he shows his readers how to make calculations to arrive at the quantity of heat to be sent into a room to keep it comfortably warm—by raising the temperature 20° Fahr. But atmospheric conditions are as variable as personal requirements; and rooms are so different in their structural characteristics and conditions that they refuse to bow to the standards on which theoretical calculations are based. Mr. Grogan's basic figure is 1000 c.ft. of air; and if the air is changed three times an hour for ventilation purposes [it is changed more than that with a gas or coal fire] 1149 units of heat per hour must be employed. This represents ⅓ unit of electricity per hour per 1000 c.ft. of air volume. But he says "experience has shown 1 watt to 1¼ watts per cubic foot of room space will generally suffice for heating a room." The word "generally" denotes the knowledge of exceptions; and heating engineers have found that in not a few cases 2½ watts are necessary per cubic foot. However, the difference between the calculated quantity of heat required to heat the air and the actual expenditure is due to losses through walls, doors, windows, ceilings, and floors. He adopts an "average" escape of heat in this way of 5 B.Th.U. per hour per square foot of surface, or ¼ unit per hour per 100 square feet. Taking the ⅓ unit per 1000 c.ft. volume of air, and ¼ unit per 100 square feet of surface for losses, a simple method is provided for determining the size of the electric radiator required for a given room, if the "simple method" would apply in all instances. But it will not. Assuming it applies to the case of a room measuring 18 ft. by 15 ft. by 10 ft. high (2700 c.ft. of air and 1200 sq. ft. of enclosing surface), then it is easy to find that the room would require the expenditure of 2·9 KW. per hour, or (say) a 3 KW. fire (assuming 100 p.ct. efficiency), which is not always sufficient in extremely cold weather. It shows how far from the truth is the "Observer" writer (referred to in the previous paragraph) on even a theoretical basis. Mr. Grogan describes how chimneyless rooms and building them diathermous by employing double walls, and taking certain other precautions, would reduce the expenditure of current for heating. Building in all conscience costs enough nowadays without adding to it on account of the low efficiency of electricity as a heating agent when there is a cheaper labour-saving one available. We cannot follow the article all through. It goes on to deal with cooking. And towards the end of it, Mr. Grogan makes the statement that when electricity for domestic purposes can be obtained at 2d. per unit, the average cost of electric service can successfully compete with gas at 5s. per 1000 c.ft. Why does it not do so? Why are so many gas undertakings getting such large business increases. One reason is—take heating for example, with gas at 5s. per 1000 c.ft., and having a potential calorific value of 500,000 B.Th.U. per 1000 c.ft.—that this can be used in a gas-fire at 75 p.ct. efficiency. The useful heat is therefore 375,000 B.Th.U.; and the balance contributes to the change of air in the room. The potential heat value of a unit of electricity is 3420 B.Th.U. 375,000 ÷ 3420 = 109 units of electricity, which, at 2d. per unit, presents an account to the consumer of 18s. 2d. We cannot say we are particularly sorry that our own experience and that of many other people refuse to confirm that of Mr. Grogan. Moreover, the mass of the people that have to employ electricity are not electrical specialists.

The London Joint Scheme and Doubts.

The Special Committee on Electricity Supply, and the Finance Committee, of the London County Council are not altogether comfortable over the position of the electricity proposals of the Government. There is too much indefiniteness about them, and too much uncertainty as to the financial part, to please the Committees advising the Council. There is the matter of the Electricity Supply (No. 2) Bill. No mention was made of this in the King's speech. Why it should be mentioned any more than the Gas Regulation Bill last year, we do not know. But electricity people think a mistake was made in not alluding to their Bill this year. Besides, there are no visible signs of the Government vigilantly prosecuting it early this session. Everything appears to be very loose about the electricity supply position; and what came upon the scene with such striking political fervour and drum-beating seems to be losing ground, friends, and support. Finance very largely dominates the situation; and unless the proposed joint authorities are placed by the Government on an effective financial footing, the Finance Committee of the County Council think there will have to be very careful consideration as to the extent the Council will be justified in taking further action in regard to the heavy expenditure in connection with the development of a scheme for the Administrative County of London, and a large area outside it. But even if the No. 2 Bill becomes an empowering Act, many of the local authorities will be very chary about financing the scheme unless under compulsion. Already the County Council have expended considerable money and time in preparing a scheme; and they have done this on the undertakings previously given by the Government. Now there are doubts and fears. But the Special Committee have persevered in the work entrusted to them. They have a scheme well under way which provides for an authority of 28 members representing the interests concerned, including two representatives for the workers of the industry. Technical and financial data and information will be submitted later on. The scheme provides for a modification of the area provisionally determined by the Electricity Commissioners. Regarding the area, it is stated that the assessable value of the Administrative County of London is about twice the size of the area outside the county included in the district, while the population is 4,521,685, as against 3,424,707 outside the county.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A meeting of the Central Executive Board of the National Gas Council was held at No. 30, Grosvenor Gardens, S.W., on Tuesday last week—Mr. D. Milne Watson in the Chair.

Coal.

The position with regard to coal contracts and prices was fully discussed.

Gas Regulation Act.

It was reported that the Corporation of East Ham had made application in the High Court for a mandamus requiring the Board of Trade to hold an inquiry into the application of the Gas Light and Coke Company under section (1) of the Act, and that the Court had granted the rule.

Carbon Monoxide Inquiry.

The evidence given by the Council's witnesses on Feb. 10 before the Carbon Monoxide Committee appointed by the Board of Trade was reported.

Gas Incombustibles Committee.

It was announced that the Council's representatives would give evidence before the above Committee some time in April. It was left to the Institution of Gas Engineers to nominate any further representatives they considered necessary.

Income-Tax Depreciation Allowance.

A resolution was read from the Midland District Executive Board of the Council, pressing for a continuance of the increase of 50 p.ct. depreciation allowance upon gasholders, meters, and cookers, for purposes of income-tax. It was reported that, although it was understood that the Somerset House authorities would not continue this increased allowance, any gas undertaking which felt it was not receiving fair treatment would have full consideration from such authorities if they would submit their case. In the event of any difficulty arising, the Council undertook to take up the case with the Inland Revenue authorities, through members of the Central Executive Board who were fully conversant with this matter.

Contract Prices.

Letters were read from the Society of British Gas Industries, dated Feb. 14, stating: (1) That it had been found impossible to compile a monthly standard list of advances in the cost of materials and labour; and (2), that the contractors felt the present moment inopportune to make a definite recommendation as to a sliding-scale clause in contracts, and that they felt it was a matter for individual arrangement between the contractor and the gas undertaking as to whether tenders should be on a sliding-scale or a firm basis for the next six months, at the end of which period the matter might be again reviewed.

It was decided that for the present these questions should be dealt with individually between the contractors and the gas undertakings. Where the latter experienced difficulty in arriving at an amicable settlement, the Council promised to take-up the matter with the Society of British Gas Industries.

Vote of Condolence.

The death was reported of Mr. S. Trow Smith, the Engineer and Manager to the Malvern Urban District Council Gas Department, and some time Secretary to the Midland District Executive Board of the Council. A resolution of condolence was carried unanimously, the members present standing.

Coke.

A lengthy discussion took place on the subject of inland coke sales. Mr. F. W. Goodenough outlined a scheme which was under consideration by the British Commercial Gas Association, with a view to the creation of local markets for the sale of coke. It was agreed to arrange for district meetings to be held throughout the country, to collect information for the purpose of considering closer co-ordination among gas undertakings in respect of the disposal of their coke supplies.

Railway Rates.

With regard to the classification of coal, coke, and patent fuel, which was left over by the Railway Rates Advisory Committee for further consideration by the railway companies, it was reported that the proposals of the railway companies had now come to hand. Coal and coke were placed in five classes; but so far the railway companies were unable to state what relation would exist between these classes. On national grounds, the Council were pressing for coal for gas-making purposes and gas coke to be placed in the cheapest class.

Meters.

It was resolved that the Joint Standing Committee of the Council and the Society of British Gas Industries on Meters should be summoned, with a view to obtaining a reduction in the price of meters.

Sulphate of Ammonia.

The unsatisfactory position with regard to markets for sulphate of ammonia and the prospects of German competition in the near future were discussed. At present it was not paying even large undertakings to manufacture sulphate, and small undertakings throughout the country were suffering great hardship. The whole question of the sulphate of ammonia position is being considered at a general meeting of the Sulphate of Ammonia Federation on March 17.

Factory and Workshop Act, 1901—Draft Regulations under Section 79.

It was reported that, in conjunction with the Association of British Chemical Manufacturers, the Council were sending a deputation on March 9 to the Home Office in connection with the amendments to the draft regulations.

ADMINISTRATION OF THE EDINBURGH GAS UNDERTAKING.

Mr. Herring's Position as Consulting Engineer.

In connection with the negotiations in regard to the appointment of a successor to Mr. Alex. Masterton as Gas Engineer to the Edinburgh Corporation, and Mr. W. R. Herring's position as Consulting Engineer, the latter gentleman has forwarded copies of the two following letters, to indicate exactly what his position is in the matter.

Copy of letter from A. Grierson, Esq., Town Clerk, Edinburgh, to W. R. Herring, Esq., 4, Arundel Street, Strand, London, W.C.

Oct. 28, 1920.

Edinburgh Boundaries Extension Act, 1920.

Dear Sir,—With reference to the transfer of the gas undertaking to the Corporation as at Nov. 2, under the provisions of the above Act, I am instructed to intimate to you that the Corporation desire you to continue to act after that date as Consulting Engineer for the undertaking, on the same terms and conditions as at present apply under your agreement with the Gas Commission.

The Corporation have appointed a Standing Committee to take charge of the gas undertaking to be known as the "Gas Committee;" and I shall give you intimation of the meetings of the Committee. The Gas Committee will take into consideration at as early a date as possible the whole question of the re-organization of the administration of the undertaking; and if this should involve any alteration in the existing agreement with you, due intimation of any proposed change will be given to you.

I shall be glad if you will kindly write me agreeing to act as Consulting Engineer for the gas undertaking under the Corporation, on the same terms and conditions as at present.

I should add that, as you are doubtless aware, Mr. Masterton has consented to continue to act as Engineer and Manager meantime, but has intimated his desire to retire on superannuation as soon as a successor to him can be appointed.—I am, &c.,

(Signed) A. Grierson, Town Clerk.

Copy of letter from W. R. Herring, Esq., 4, Arundel Street, Strand, W.C. 2, to the Town Clerk, City Chambers, Edinburgh.

Nov. 1, 1920.

Edinburgh Boundaries Extension Act, 1920.

My dear Sir,—I am in receipt of your letter of the 28th ult., referring to the transfer of the gas undertaking to the Corporation on the 2nd of November, and intimating that the Corporation desire me to continue to act after that date as Consulting Engineer for the undertaking on the same terms and conditions as at present apply.

Allow me to say, in reply, that I shall be happy to accede to this request.

I also note that a Standing Committee to take charge of the gas undertaking has been formed; and at an early date this Committee will take into consideration the question of the re-organization of the administration of the undertaking, and that should this involve any alteration in the existing agreement with me, due intimation of any proposed change will be given.

I appreciate the position in which the Town Council are placed in connection with this undertaking; and in so far as I am concerned, I would like them to feel they are absolutely free to deal with the matter in any way they think proper—either I will be happy to continue as Supervising Consulting Engineer for the undertaking under the present terms and conditions, in so far as they are applicable, or to accept reasonable compensation under the Act, and give up my position as Consulting Engineer.—I am, &c., (Signed) W. R. Herring.

Declinkering Water-Gas Generators.

There is described in a pamphlet issued by Mr. G. A. Bronder, of No. 150, Nassau Street, New York, a "power barring apparatus for declinkering water-gas generators." This apparatus, it is stated, consists of a guide, which is set into a ring fitting into the mouthpiece of the generator. The guide is so fastened as to allow any angle of inclination to be given the bar. It also allows a motion from side to side, which permits the operator to bar fully 6 ft. of the circumference before turning round to another position. The bar is easily manipulated by means of two handles set at right angles, and the shoulder-piece, which fits around the shoulder. The bar is 2¼ in. square, and weighs about 400 lbs. It runs smoothly on rollers set in the guide, and is held by means of a fireproof sling set into a pin a little above the centre of gravity of the bar. The engine used is of the four-cylinder reversible type, and will hold the bar suspended in the air. The work is done by two men; and it is claimed that it takes about ten minutes to bar-down a generator with the hardest kind of clinker.

GLOVER-WEST VERTICAL RETORTS AT DENTON.

On Wednesday last the new installation of Glover-West vertical retorts at the Denton Gas-Works was formally opened by Councillor Robert Harrison, J.P., the Chairman of the Gas Committee, in the presence of Councillor John Bardsley, J.P., the Chairman of the Urban District Council of Denton, members of the Committee, and other interested visitors. The party was conducted over the gas-works and inspected the many additions and improvements which have been made in the endeavour to bring the whole of the plant into a state of efficiency.

Prior to the war the question of extensions to the gas-making plant, necessary owing to the continually increasing demand, had been considered; and a number of other works had been visited by the Gas Committee with a view to the re-organization of the coal-gas plant. But the war prevented any extensions or alterations being undertaken. It was hoped, however, by working the carburetted water-gas plant (erected in 1913) to its utmost capacity, the Committee would be enabled to maintain an efficient supply of gas. But the war lasted far longer than was anticipated, and during this period great difficulty was experienced in keeping the existing plant in efficient working condition. On the retirement of the late Manager, the Chairman of the Manchester Corporation Gas Committee (Alderman William Kay, J.P.) was approached for assistance; and he allowed Mr. W. Buckley, the Manager of the Droylsden Station, to take charge of the Denton Gas-Works and assist as far as possible pending the appointment of a Resident Engineer, to which position Mr. H. C. Handley, of Whitworth and Rochdale, succeeded in August, 1919.

Acting on the advice of Mr. Buckley, the Council decided to reorganize the works—bringing them up to date, and thoroughly overhauling every portion of the plant. After careful consideration, it was decided to erect an installation of vertical retorts with a normal capacity of half-a-million cubic feet of gas per day. This contract was let to the West's Gas Improvement Company, Ltd.

Figs. 1 and 2 show an elevation and a plan of the installation of vertical retorts which occupies a space in the existing retort-house previously covered by two working settings of hand-fired horizontal retorts. The sixteen Glover-West vertical retorts are arranged in two lines across the retort-house, and at right angles to the coal-store and elevated railway. It is interesting to note that the main flue from the horizontal settings to the chimney passes below the foundations of the vertical retort-bench, and has been kept in action throughout the erection and starting to work of the vertical retorts.

As usual in installations of this size, the retorts are heated in units of two. The effect of this is that a carbonizing capacity of 70,000 to 80,000 c.ft. per day can be put in or out of operation within a few hours; and half this capacity (or one retort) can be similarly manipulated for a short time to deal with variations in demand. In view of the fact that the consumption of gas for industrial purposes at Denton—the staple industry being hat manufacture—is liable to great fluctuations, the importance of the size and the manipulation of the unit will be obvious.

The Glover-West system of heating is sufficiently well known, but it is well to repeat that not only are all the retorts equally heated, but the heat is capable of being evenly distributed throughout the length of the retort or increased towards the base to take advantage of the practice of "steaming." The retorts themselves (constructed of the highest grade of silica material) are of the well-known elliptical shape which, as experience has proved, gives the longest possible life and the best results in working.

The coal is brought into the works on the overhead railway above referred to, and shown on the elevation. The coal-breaker for the new installation was, however, placed below the floor-level of the store so that supplies could be taken from stock as well as from the wagons. A gravity-bucket elevator-conveyor receives the coal from the breaker, elevates it, and distributes it in the coal bunkers above the retort-bench. The bunkers are of a capacity equal to forty-eight hours' consumption of coal, so that night and Sunday work for coaling are both avoided. The same gravity-bucket elevator is used for raising supplies of coke to the producers and to the retorts for use after standing-off for any reason, such as for scurfing—7 tons storage of coke being provided for these purposes. The coal breaker is driven by a 20-HP. gas-engine, manufactured by Messrs. Bates & Scholes, of Denton; and for the coke extractors two duplicate gas-engines, each of 4 HP., are provided. The gravity-bucket conveyor is driven by an 8-HP. steam-engine of the West Company's double-cylinder enclosed type.

The vertical retort installation is housed in a well-ventilated extension of the retort-house; the existing walls being surmounted by the light brick and steel structure which may be said to be a feature of the Glover-West system.

The new carbonizing plant has taken the place of 112 mouthpieces on the old system of stop-end horizontal retorts and the water-gas plant of a nominal capacity of 300,000 c.ft. per day. The whole of this plant has been shut-down and, from the date of starting (Dec. 19 last) all demands have been met by the Glover-West vertical retorts.

Already it may be confidently said that the expenditure upon the new plant has been amply justified. The cost of manufacture during the two months has been reduced by 40 p.ct. and the yield of gas has been increased by 4000 to 5000 c.ft. per ton of coal carbonized. The revenue will also be improved by the increased quantity of coke, tar, and ammonia for sale. The Gas Committee have every reason to hope that the economies effected by the new plant will be very shortly reflected in a reduction in the price of gas, and that they will be able to meet the demand created by the many applications received for gas-cookers, gas-fires, &c.

In addition to new carbonizing plant, the whole of the auxiliary apparatus has been carefully overhauled. The old steam-jet exhauster has been replaced by two modern exhausters manufactured by Messrs. George Waller & Son. A tar extractor and rotary washer have been installed—the whole capable of dealing with 750,000 c.ft. per day.

This apparatus is shown in fig. 3; and it will be noted that the rotary washer, which is of Messrs. Holmes's latest pattern, is arranged in two sections, and fitted with bye-passes so that it is possible to work either section at will. The purifiers have been thoroughly repaired—new sheeting being provided for the covers, which were in a very leaky condition.

In conclusion, we may quote the following paragraph from the

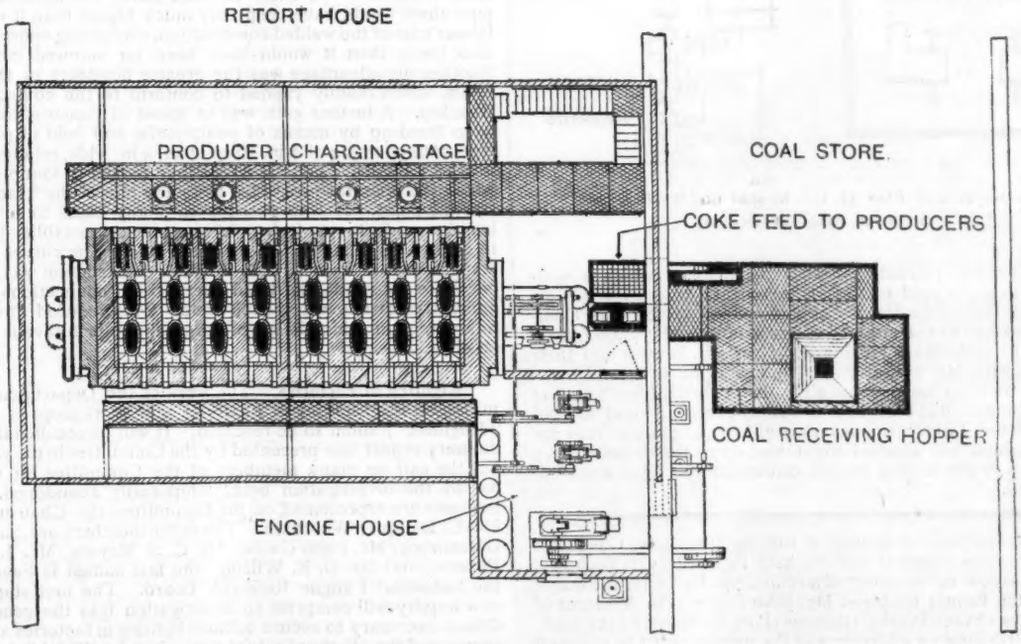


FIG. 1.—PLAN OF WEST'S GAS IMPROVEMENT COMPANY'S PLANT AT THE DENTON GAS-WORKS.

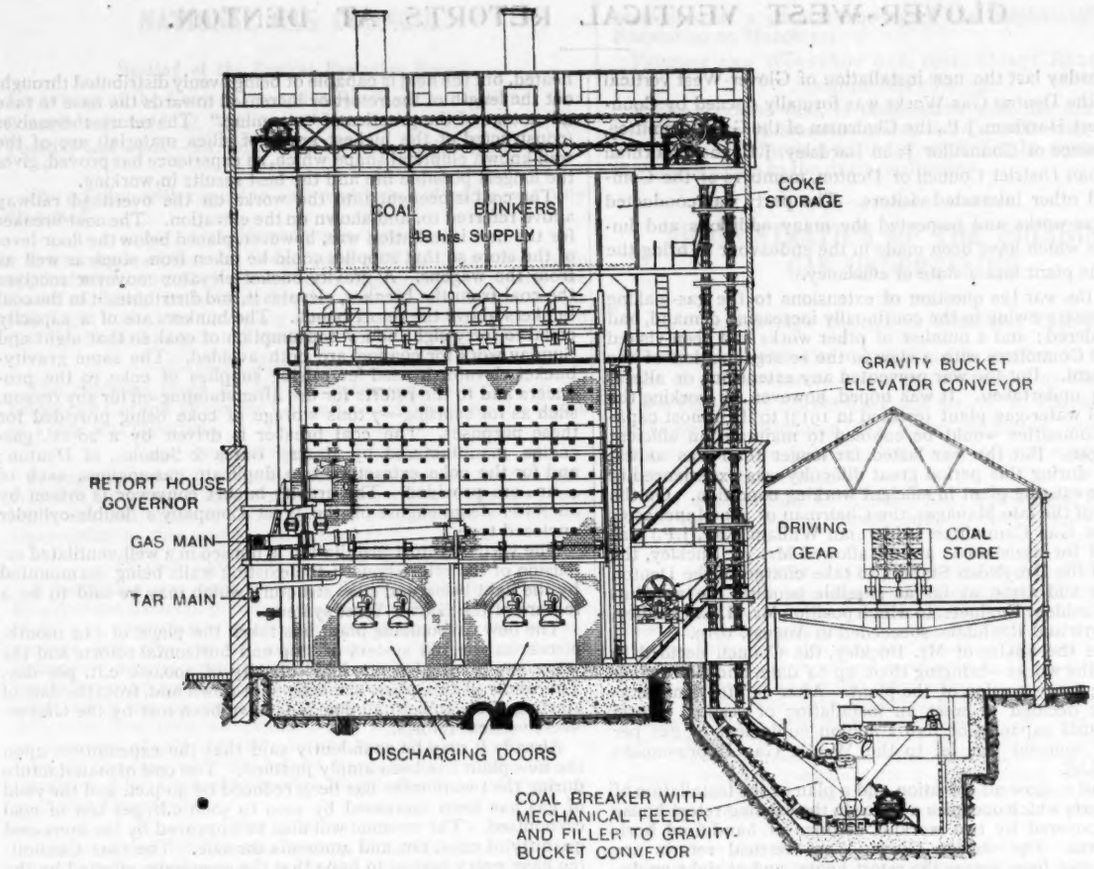


FIG. 2.—CROSS-SECTION OF THE RETORT PLANT AT THE DENTON GAS-WORKS.

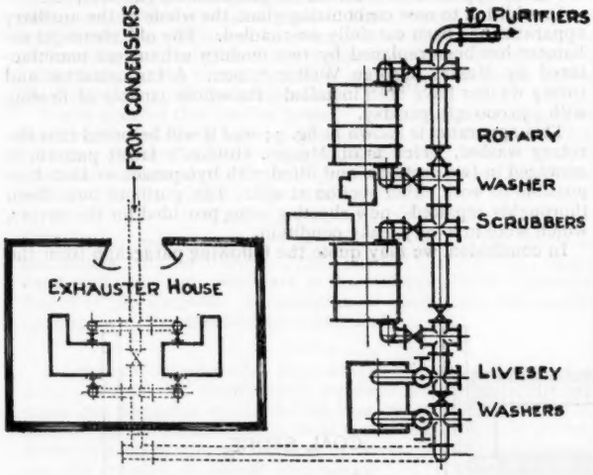


Fig. 3.—Ground Plan of the Exhauster, Washer, and Scrubber Plant at Denton.

"North Cheshire Herald" of Dec. 23, 1920, in which a well-merited tribute is paid to the management: "Very few people know what difficulties the working members of the Gas Committee have had to encounter. An expenditure of £40,000 is no light task to undertake; but Messrs. Harrison, Brown, and their colleagues, with Mr. Handley, the Manager, have worked heroically, and we must say successfully. It has really been a marvel how the Manager has been able to supply gas at all; and, instead of complaining, Denton ratepayers ought to compliment him for his work, which has entailed night and day attendance. Very great credit is due to him, for the circumstances have been unprecedented."

The annual general meeting of the Scottish Junior Gas Association (Western District) will be held in the Royal Technical College, Glasgow, on Saturday afternoon, April 2. After the transaction of the formal business, Mr. John Frazer, the Manager of the Dalmarnock Gas-Works, Glasgow (Past-President of the Association), will deliver an address; and the meeting is to be followed by the annual social gathering.

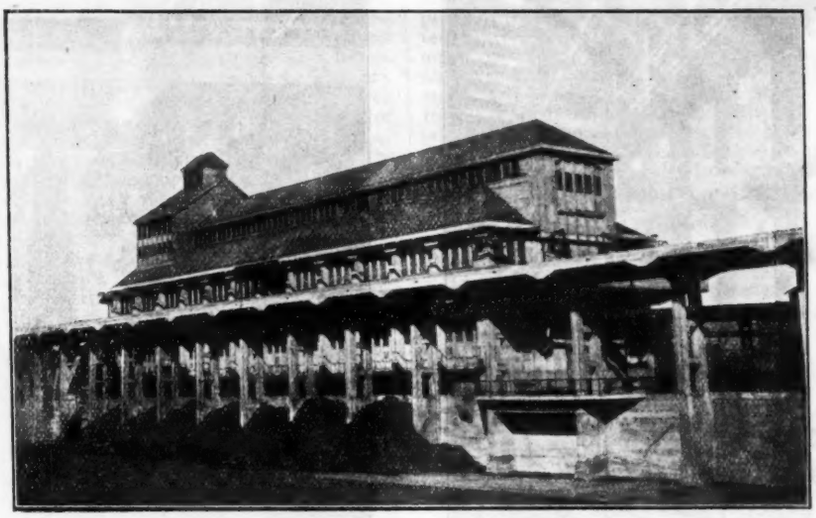
A BIG WELDED STEEL MAIN.

In connection with a new 28-mile pipe-line, which carries water from the Atlantic watershed to serve a city on the Pacific slope, the use of oxy-acetylene welding, instead of adopting riveted or screwed joints, and in preference to welding by other processes, is one of the most important features from an engineering point of view. There are 3674 ft. of 26-in. and 22,368 ft. of 24-in. pipe welded in this manner. The reason for using welded construction was primarily one of efficiency, though it also resulted in marked economy. To have secured the same strength in the joints with screwed pipes, very much heavier pipe would have been required; and if riveted pipe had been used, lapping the joints would have been necessary. In either of these cases, the material cost for pipe alone would have been very much higher than it was. The labour cost of the welded construction, everything considered, was also lower than it would have been for screwed connections. Another big advantage was the greater flexibility of the welded joints, which readily yielded to conform to the contours of the trenches. A further gain was in speed of construction. Joints were lined-up by means of pump-jacks, and held in position by steel clamps made of ¾-in. strap steel, 3 in. wide, retained in position by a band. The joints were then tacked in four places, after which the operator proceeded from any one of the "tacks" as a starting-point. It was possible in many cases to turn jointed lengths 200 ft. to 300 ft. long at one time, thus enabling the welder to operate continuously on top of the pipe. The curves were very numerous on this work; and the joint construction was so carried out as to distribute the bend over several connections—a small amount being allowed at each weld. This reduced flow friction to a minimum, which is one of the great points in favour of welded construction.

Lighting of Factories.—The work of the Departmental Committee on the Lighting of Factories and Workshops is (says the "Engineer") about to be resumed. It will be recalled that a preliminary report was presented by the Committee in the year 1915; but the call on many members of the Committee for war-work led to the investigation being temporarily abandoned. Varied interests are represented on the Committee, the Chairman being Mr. C. Dampier Whetham. The other members are Sir Richard Glazebrook, Mr. Leon Gaster, Dr. C. S. Meyers, Mr. J. Herbert Parsons, and Mr. D. R. Wilson—the last-named is Secretary to the Industrial Fatigue Research Board. The first stage of the new inquiry will comprise an investigation into the general conditions necessary to secure suitable lighting in factories and workshops, and the effects of mixed natural and artificial lighting, with special reference to the lighting of underground workrooms.

WOODALL-DUCKHAM SETTINGS ON THE CONTINENT.

DRESDEN INSTALLATION—WORKING FOR THE MAXIMUM UTILIZATION OF WASTE HEAT.



A SIDE VIEW OF THE RETORT-HOUSE.

WE have received for publication some interesting photographs and a description of the installation of continuous vertical retort on the Woodall-Duckham system erected at the Dresden Municipal Gas-Works. They show what further progress has been made in securing heat economy from what was in former times waste heat.

Before the adoption in Germany of the Woodall-Duckham continuous vertical retort system on the large scale, experimental settings were erected (in 1912-13) by both the Berlin and the Dresden Municipalities. The favourable results obtained with these experimental settings induced the Berlin Municipality to order five settings of four retorts each, capable altogether of carbonizing 100 tons of coal per day. This plant was erected in 1916-17 by the German firm Adolfshütte, of Bautzen, who are the licencees for the Woodall-Duckham Company. The settings were put to work in December, 1917, and the working of the installation was so satisfactory that an extension of twelve retorts was built in 1918-19. A difference in these settings from the original standard type is found in the fact that the producer and recuperator are situated in line with the minor axis of the retorts, instead of being placed between the retorts. Thus every two retorts have their own producer and recuperator. For the 32 retorts the guaranteed make of gas was two million cubic feet per day, which was easily obtained—the throughput of coal being as much as 22 tons per setting.

THE DRESDEN INSTALLATION—HEATING INNOVATIONS.

The construction of the plant at the Dresden Municipal Gas-Works was carried out in 1917-18, and gas-making commenced in October, 1918. The plant consists of seven settings of four retorts each, capable altogether of carbonizing 140 tons of coal per twenty-four hours. The characteristics of the plant are much the same as those of the Berlin installation, except that in place of the built-in producers, the settings are heated by an outside producer plant, and that recuperators to heat-up the producer gas have been incorporated in the settings in the place where the built-in producers would ordinarily have been constructed.

Another feature of the plant is that the secondary air is brought to the settings under pressure on the same lines as the gas. This enables definite regulation of the heats by two main valves; while for further regulating the heat specially for one or more retorts, or when some of the retorts are shut-down for scurfing, extra producer gas valves and air-cocks are provided.

The waste gases from the settings, having a temperature of about 400° to 500° C., pass through a superheater and economizer into a short steel stack worked by mechanical draught—the outlet temperature being about 250° to 280° C. The provision of mechanical draught requires about 12 to 15 H.P.

A retort-house governor of special construction ensures an even pull at the retorts.

During recent years on the Continent, there has been a tendency to favour regenerative settings in lieu of recuperative settings. The results at Dresden, and similar installations, have shown that recuperative settings give as good heat efficiencies—both gas and air are of high temperature—as regenerative settings. This can be clearly seen by the low temperature of the gases entering the stack—*i.e.*, about the same as the temperature of the waste gases of settings heated on the regenerative principle.

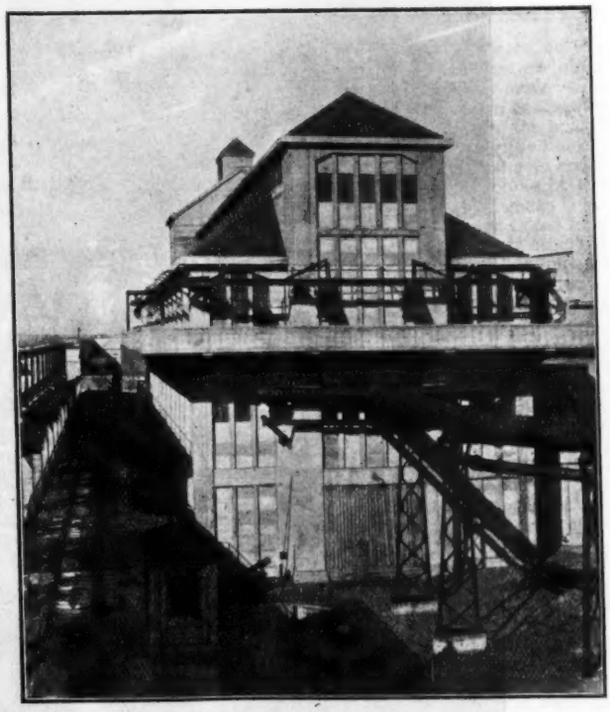
CONSTANT AUTOMATIC CONTROL.

The supervision of the plant is greatly facilitated by a number of recording instruments, whose indications (as exhibited by specimen charts) are of considerable value. Striking evenness is shown at all parts of the working. There is a CO_2 recorder for the waste gases. Measurement is made of the temperature of the waste gases and of the steam before and after superheating; the chimney pull and the pull on the retorts are recorded; and, when steaming is being carried out, record is being kept of the steam pressure. These automatic records make control by the engineer much easier than it would be otherwise.

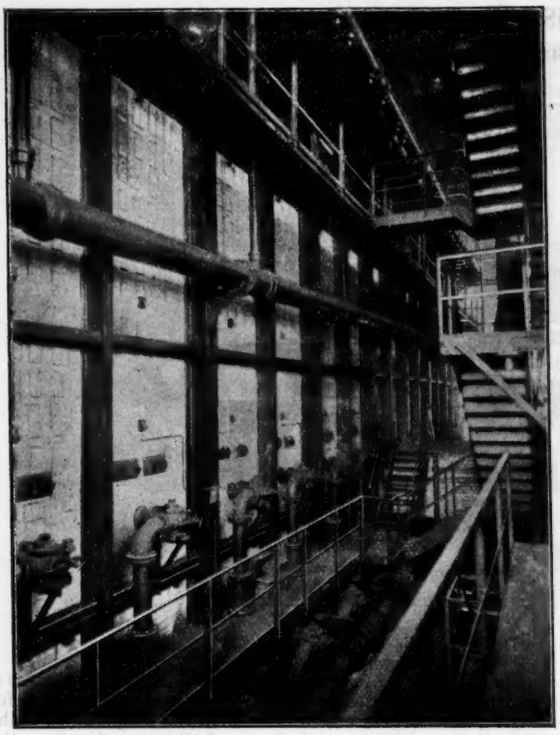
WORKING RESULTS.

The amount of gas produced by the 28 retorts under ordinary working conditions without steaming is 52,500 cubic metres per day; the gas having a thermal value of 5100 calories. Translated, these figures represent a make of 1,850,000 c.ft. of 580 B.Th.U. gas per day. As the plant is being worked with steam, this figure has been exceeded. The guaranteed fuel figure is 1450 B.Th.U. for each pound of coal carbonized without steaming. Although the plant has been working under the most trying conditions in regard to coal supply, it has exceeded its guaranteed gas figure; and the fuel figure has been under the guarantee.

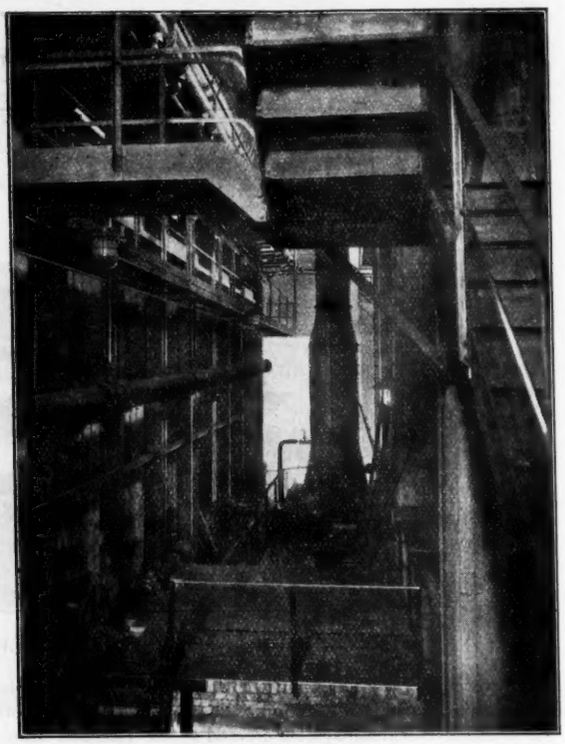
This installation of 28 retorts represents a quarter of the proposed extension plant at the Dresden Reich Gas-Works; and the



THE RETORT-HOUSE, SHOWING THE TELPHER ARRANGEMENT AND THE GAS OFF-TAKE.



SIDE VIEW, SHOWING THE GAS AND SECONDARY AIR SUPPLY.



SIDE VIEW, SHOWING THE MECHANICAL DRAUGHT ARRANGEMENT.

retort-house, as well as the coal and coke handling plant, have been constructed of such a size as to allow of the present plant's being doubled.

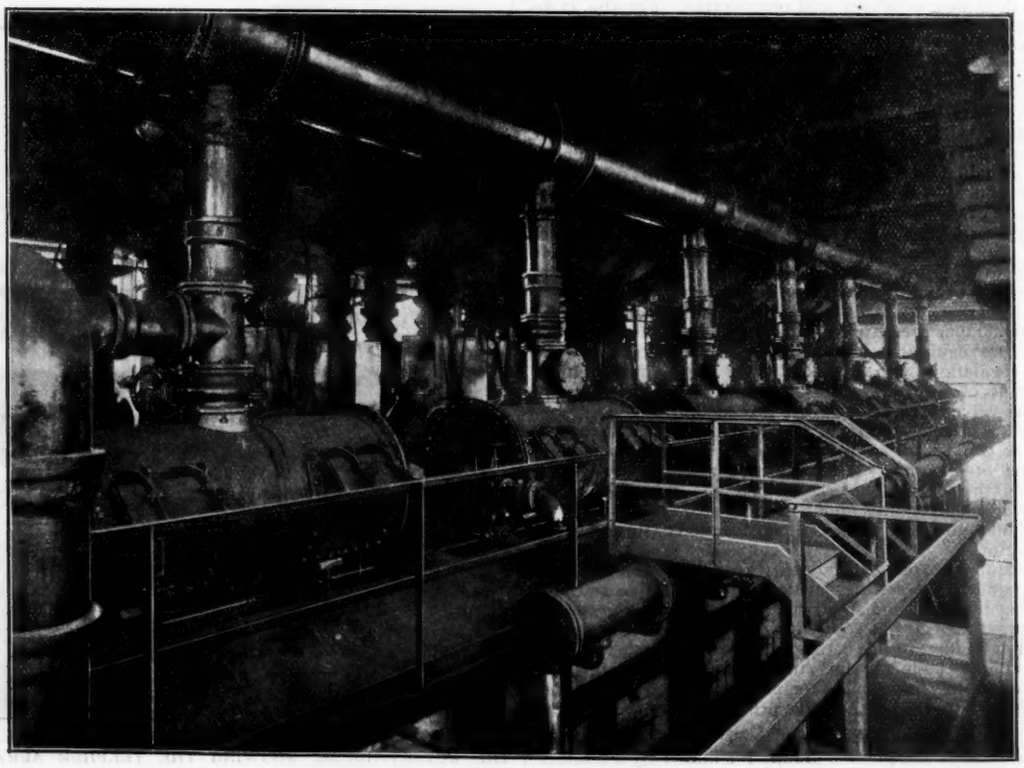
Coal and Coke Plants.

The coal is brought into the works on an overhead railway; and the wagons are discharged by a tipping arrangement into a ferro-concrete hopper. Thence the coal passes through the breaker, into a bucket elevator, and is carried overhead by a bucket conveyor, delivering into the hoppers above the settings.

Regarding the coke, the water-seal discharging device is operated by a crank arrangement fixed to the stanchions. The coke is discharged into skips, two of which are carried by a small wagon. The wagons are removed by an electric transporter to the end of the bench, where the skips are raised, by an electric hoist and transporter which runs round the whole house, and by it are transferred to the screening plant, into which the coke is delivered, or, if so required, deposited in the yard. The coke for the producers is drawn from the screening plant hoppers, and deposited in the producer plant hoppers, which deliver it into skips for transference to the producers.

The Outside Producer Plant.

The outside producer plant consists of four mechanical type Kerperley-Marischka producers, having a capacity for gasifying 14 to 16 tons of coke breeze in twenty-four hours. The producers are water-jacketed; and the upper part of each is formed into a water-tube boiler. The steam generated is about 1 lb. for each



TOP OF THE RETORT-BENCH.

pound of fuel gasified. The amount of steam produced is sufficient to drive the dust separators, exhausters, and fans, as well as to supply the necessary steam for steaming the retorts. The gas passes through coolers, which are fitted with water-sprays, with the object of causing a large part of the dust contained in the gas to deposit. From there the gas passes to the final cleanser, or dust separator, the operation of which synchronizes with the exhauster that gives the necessary pressure for passing the gas through the water separator and the safety seal-pot to the bench. In order to ensure an even pressure, and to counterbalance any irregular make of gas, a small relief holder is situated between the seal-pot and the bench. Two producers amply suffice for making all the gas required for the bench of 28 retorts.

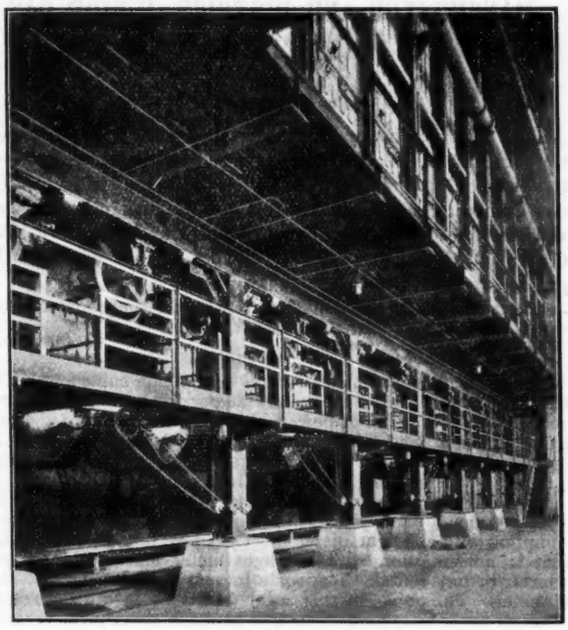
Recording instruments are also used in connection with the producer plant. They show the amount of CO_2 in the producer gas and the quantity of primary air supplied to the producers, as well as its temperature and saturation, and the amount of steam supplied to the primary air.

The exhauster and the blowers for the primary and secondary air are on one shaft, driven by a steam turbine of 120 H.P. The turbine is worked with superheated steam of 570° Fahr.—the pressure being about 10 atmospheres (150 lbs.).

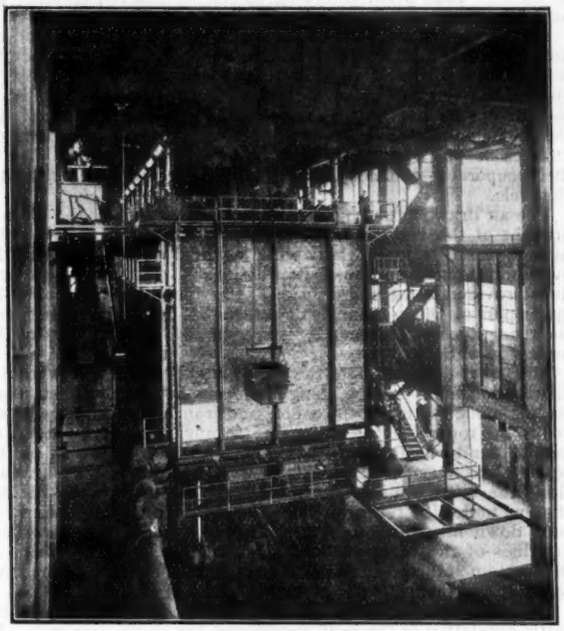
In consequence of this arrangement of primary and secondary air running under the same conditions, the gas and air supplies to the bench are always in correct proportions, and therefore an easily regulated combustion is ensured.

It may also be mentioned that the steam-turbine exhaust gives off its latent heat to the feed-water heater, which raises the temperature of the water to about 40° C. The feed water at this temperature is carried forward through the economizer (previously referred to) in the waste-gas flue, and is raised there to about 100° C. From there it passes on to the gas-producer steam generators. The saturated steam at 160 lbs. pressure travels through the superheater (at the inlet of the waste-gas flue) which brings the temperature of the steam up to about 350° C. The main portion of the steam is used for the steam-turbine, and a certain amount is taken off for steaming the retorts. In every respect in this installation the maximum possible use is made of all available heat.

The carbonizing plant, as already mentioned, was built by Adolfshütte of Bautzen, who are the licencees of the Woodall-Duckham Company; and the producer-gas plant was constructed by Koppers, the well-known coke-oven contractors.



THE COKE EXTRACTING GEARING.



GENERAL END VIEW OF THE BENCH, SHOWING THE TELPHER ARRANGEMENTS FOR COKE.

Pipe-Pusher for Installing Services.

A question-and-answer column in the "Gas Record," of Chicago, in reply to a request for experience with the use of a pipe-pusher for installing services, gives an abstract of an article on the subject by Mr. F. C. Amsbury. Before beginning the pushing of the service-pipe, it seems, it is necessary to dig a trench about 18 ft. long, to take a full-length galvanized wrought-iron pipe. The pipe-pusher is first laid in the trench, and fastened down by means of wooden stakes. It consists of an iron frame, on which is a steel carriage. The pipe is laid in position on the carriage, and is fastened securely by a locking device. The carriage and pipe are moved forward by means of a ratchet with a long handle, the carriage travelling about 2 ft. When it has reached the end of the frame, the locks are released, leaving the pipe and carriage free; and the carriage is moved back, and the pipe again locked. This operation is repeated, until the pipe has gone the required distance. In order to keep the pipe from drifting out of the straight line, it is turned frequently, with an ordinary pipe-wrench. There is seldom trouble in pushing the pipe to the point desired. When there is a leak in a service-pipe under the pavement, Mr. Amsbury, instead of tearing-up the pavement to repair it, pushes a new service through, and abandons the old one, finding this course much cheaper than digging-up the pavement and relaying it. In Mr. Amsbury's case, the soil in the streets is mostly heavy clay; in sandy soils the pushing would naturally be much easier.

A visit has been arranged for next Saturday afternoon of members of the Yorkshire Junior Gas Association to the Birkshall Gas-Works, Leisterdyke, Bradford. The chief feature of interest at the works is a 5 million cubic feet per day Woodall-Duckham vertical retort installation, complete with electrically driven elevators, conveyors, wagon-tippers, and coke-screening plant.

Water Gas Relief Holder Gauge.—Mr. R. E. Pierce, in the American "Gas Age," points out that relief holders are often located some distance from where the gas is actually made; and therefore it is necessary to set-up a gauge, in order to enable the gas operator to take a check of the quantity of gas in the holder into which he is sending gas, and so avoid uncupping the holder. If the gauge is installed on the holder itself, the operator, in order to read it, must leave his machine; and in the course of the day much time is wasted in this way. If, however, a gauge is installed on the operating floor, the gas maker is able to tell at a glance the amount of gas in the holder. A lead weight is attached to a rope, which passes over a pulley and through a 1-in. pipe to another pulley which must be fitted on top of the relief holder.

Making Gas from Wood.—There has appeared in "Le Génie Civil" an account of a process of wood distillation for gas making adopted during the war. Abstracting the article, the "Technical Review" says the great disadvantage of wood for the purpose of making gas is the high percentage of carbonic acid gas in the product, which can only be removed by chalk. The expense of purification by this means was so great that a number of works mixed the wood gas with their other gas, and sold it all as a low-quality gas. There was discovered at Zurich a process by which the wood gas was distilled, and then passed through incandescent charcoal, which, by a process of reduction, diminished the quantity of CO_2 present in the gas, though the heating had an injurious effect on the heavy hydrocarbons and reduced the calorific value of the gas. In spite of this, however, as the production of the gas was increased by this method, it was adopted by a large number of gas-works. The principal comparisons with straight distillation of wood are: Output of gas doubled; calorific value reduced only 22 p.ct.; CO_2 content reduced by one-fourth; heavy hydrocarbon content reduced at least two-thirds; methane content halved; hydrogen content increased by four-fifths; tar product halved; acetic acid content reduced to practically *nil*; total value increased 45 p.ct.; and the gas made considerably lighter.

"PIRON" COKE-OVENS AT WOODWARD (ALA.).

The results are now available of a year's operation of an installation of twelve "Piron" coke-ovens erected by the American Italian Commercial Corporation for demonstration purposes at the bye-product plant of the Woodward Iron Company, of Woodward (Ala.), for which, among others, the advantages are claimed of short coking time, large coke and surplus gas output, and easy working.

The chief characteristic of the ovens, according to Mr. Emil Piron, of New York [writing in the "Gas Age"], is the continuous heating from the top downward, without inversion of any kind, and the arrangement for continuous recuperation of heat instead of employing the usual regenerative system. The recuperator consists of rows of vertical flues, one for air and the other for burned gas. These rows are arranged adjacent to each other in such a manner that the wall between the two rows is in contact with the burned gas on one side and with the air on the other side, transmitting the heat continuously from the burned gas to the air. The burned gas flues are under the coking chamber, and the hot air flues lie beside it. There are two, four, or six rows of flues to each oven, according to the surface requirement for heat transmission.

Situated below the rows of vertical flues of the recuperator are horizontal channels for fresh air and for burned gas; the admission of fresh air being regulated at the channel entrance by registers, and the suction of the stack channel being controlled at the flue-gas channel exit by registers also, so that regulation and the starting and stopping operation of each oven are independent. Orifices or ports located at the bottom of each vertical flue of the recuperator connect these vertical flues with the horizontal channels.

The air drawn through the air-channel registers by the natural draught of the vertical flues, ascends in these flues, is thereby heated, passes into the horizontal channel at the level of the oven bottom, and continues its way upward through the vertical flues provided in the hollow brick of the side walls. Reaching the upper part of these channels, it returns in flues located between the rising flues, and descends in the vertical heating flues of the oven side walls.

The gas is delivered into the top of the descending flue from a distribution main passing along the top of the oven, with branches leading along the top of the oven; and from these drop the pipes, one to the top of each heating flue, through which inspection of the flue can be easily made. Coming into the upper part of the heating flue, the gas meets the hot air, and burns while descending along the oven walls. The burned gas passes into the bottom channel under the retort through the orifice at the bottom end of each down flue, then continues downward through the vertical gas flues of the recuperator, and passes through the orifices at the bottom into the horizontal channel through the damper or register, and thence to the stack channel and chimney.

The main feature claimed for "Piron" ovens is perfect automatic regulation of the heat throughout the whole side wall. In "Piron" ovens, all orifices are large; and almost no resistance opposes the gas circulation. The total resistance between the entrance of air in the recuperators and the outlet for waste gas to the stack is an unusually small one—not exceeding 1 mm. of water column. This advantage is due to the downward combustion.

When gas is admitted in the bottom of the side wall and the flame burns upwards, the draught is naturally stronger where the vertical flues are hotter. As a stronger draught increases the combustion, these flues have a tendency to grow still hotter; and it is necessary to admit the gas through small orifices offering a noticeable resistance, to avoid overheating of these flues. With downward combustion, it is quite different, because, when the flues are hotter, the downward draught is smaller, and the intensity of combustion decreases without need of any means of regulation. The great uniformity of heating, combined with the fact that there is no inversion, and flames continually heat the whole length of the side wall, explains the short coking time and the resulting large output of coke per oven and small fuel gas consumption per ton of coal.

The hot air from the recuperators passes into a horizontal channel, and through ports in the bottle-brick of each flue leading upward beside the oven, before reaching the upper part of the oven for combustion in the down flue. This has a cooling effect on the bottle-brick situated between two heating flues, and prevents it melting. The bottle-brick of the upward flue, being maintained at a lower temperature, offers better resistance; and the strength of the side wall is therefore increased. Another factor which contributes toward strengthening the side wall is the non-use of the horizontal flue at the top of the side wall.

The facility of operation is the direct result of the excellent automatic heat regulation and the continuous heating without inversion. Other ovens have been designed using recuperators of heat, and heating from the top with downward combustion. The defect in their recuperators was the leakage through the joints and cracks due to defective combination of bricks and the high-pressure difference between the air and waste-gas flues of the recuperators. The "Piron" recuperators have all flues going in one vertical direction; and they can thus expand and contract during any number of coolings and heatings of the battery without showing cracks. The small difference in pressure of 1 mm. of water-column between the air and waste gas in the two series of flues, makes leakage through the joints practically nothing.

The reason why many of the attempts to use downward combustion have failed is probably because the gas was brought in contact with the air at a point where the air and gas did not meet in parallel streams and at almost equal velocity. When air and gas meet in parallel streams at equal velocity, there is no reason why the flames should not burn while going downward as well as when going upward; and, in fact, the downward combustion at Woodward functions perfectly. It is true that recuperators of heat for the same efficiency require more refractory material than regenerators; but in the case of regenerators the ovens must be supported by strong walls, while the recuperators of this oven are constructed in such a manner that they support the ovens without any wall.

In general figures the ovens at Woodward have resulted in a saving of some 25 p.ct. of fuel gas and in a 10 to 20 p.ct. shorter coking time. The weight of refractories was only 85 short tons per oven, for a size loading over 29,000 lbs. of wet coal. With a coal of usual content in volatile matter and moisture, these ovens use less than usual of the gas produced for fuel purposes, saving a greater percentage as surplus gas.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Blackpool Gas-Works.

Some fifty members of the Association visited the Blackpool Corporation Gas-Works last Saturday week, and were received by the Vice-Chairman (Mr. W. Taylor) and some members of the Gas Committee, along with Mr. W. Chew (Engineer and Manager) and Mr. J. H. Chew (the Deputy Engineer and Manager). The Chairman (Councillor Peter J. Tomlinson) was unable to be present, and sent his regrets.

In anticipation of the visit, a *brochure* had been prepared, from which the following particulars are taken.

Make of Gas and Method of Charging.

The present annual make of gas is 800 million cubic feet. The gas tariff is invoiced to consumers at per 100 c.ft., in lieu of per 1000 c.ft. as follows: For power, 4d.; ordinary meters, 4½d.; prepayment meters, 5d. With this tariff the gross profit is 9 p.ct. upon the whole capital outlay. Meters are free beyond a minimum quarterly consumption amounting to 1s. per light demand, as indicated by the size of meter installed, thus: Consumption with a 2-light meter must yield 2s. per quarter or pay rental; consumption with a 3-light meter must yield 3s. per quarter or pay rental; consumption with a 5-light meter must yield 5s. per quarter or pay rental. The scale increases to the largest size of meter. The object of this regulation is to ensure the return of stand-by or little-used meters, or to make them yield revenue if retained. It has accomplished the purpose, especially where meters are now too large for consumers' present requirements.

Manufacturing Plant.

The types of gas-making plant are horizontal retorts, charged and discharged by De Brouwer stoking machine, and coke handled by Dempster telpher; inclined retorts and hot-coke conveyor; Glover-West vertical retorts and Dempster telpher coke-handling plant; carburetted water-gas plants as auxiliaries. Both air and water cooled condensers are installed. Ten large and spacious purifiers are in use, together with efficient washing and scrubbing apparatus of the usual type.

The distribution system on the outskirts of the district has been augmented by high-pressure boosted mains fitted with suitable governors.

New Season's Additions Complete or in Progress.

An installation of West's continuous horizontal retorts has recently been put into operation. This being an entirely new feature, which proved to be a source of attraction, as it was the first installation in the country. There are four retorts, and they carbonize coal and produce water gas in the same apparatus, all of which can be controlled at will. The coal is fed into the retorts by hydraulic power. The installation is fitted-up in the same space as an ordinary bed of eight ⌂ retorts; the one under review having been put in an arch that had been formerly occupied by an ordinary setting.

A new type of furnace grate to the vertical retort producer has been introduced, in order to maintain a more regular supply of producer gas to the settings. At the same time it relieves the gas makers of the most laborious part of their duties in clinkering in the old way.

In steam production, three of the Lancashire boilers are now re-fitted with Crosthwaite patent furnace bars, which are found to be very beneficial. Spencer's latest "Simplex" and "Climax" grids are now fitted to most of the purifiers—thus increasing their capacity and economizing in working cost. Additional ammonia concentration plant is also under construction. A combined 140-HP. gas-engine and twin reciprocating compressor for high-pressure gas distribution is at present being installed. A new tubular water condenser at the inlet to the ammonia washers is

in course of construction. A 100-HP. gas-engine is being added to the power plant. An additional Lancashire boiler fitted with auxiliary oil-fuel feed is under construction. Re-housing the two existing boilers is at present taking place. The mechanical and engineers' plant also is being removed to larger premises. The addition of a meter repairing shop and a new laboratory are being carried out. A paraffin vaporizer recently installed is proving very effective.

THE VISITORS' THANKS AND APPRECIATION.

At the conclusion of the inspection of the works the party were taken by reserved tramcar to the Savoy Café, and had high tea, kindly provided by Mr. Chew (the Engineer) and Mr. Wild, the representative of West's Gas Improvement Company.

Mr. J. H. RANFT (Lytham) moved a vote of thanks to the Chairman and Gas Committee, to the Gas Engineer and his son (the Deputy Gas Engineer), and to Mr. Wild, for their kindness to them that afternoon. They could not visit a works in the district that could compare with the Blackpool works, inasmuch as all types of plant were to be seen at work—horizontals, verticals, carburetted water gas plants, &c. But what had undoubtedly brought them together that afternoon was the horizontal continuous retorts; and he hoped that Mr. Chew and Mr. Wild would get the results they expected from this installation, which he thought would make great strides when it became known.

Mr. RODGERSON (Middleton) seconded, and expressed the opinion that the "Wild-West" plant seemed to combine two or three systems, and that the capital charges upon the plant would bring it within the reach of very small undertakings.

Mr. TEASDALE (Salford) remarked upon the number of Seniors who had availed themselves of visits along with the Juniors, evidently showing that the visits were of good value. He also remarked how indebted the profession was to the engineers who undertook pioneer work such as they had seen that afternoon.

Mr. W. TAYLOR (Vice-Chairman) replied to the vote of thanks in a few chosen words, and apologized on behalf of the Chairman for the latter's absence.

Mr. W. CHEW said how pleased they were to see the members. His Committee made no hesitation in acceding to the Association's request, and were pleased that they could show them so much of real interest. As regards the new plant, he thought that in about a month's time they would be in a position to make a fair test of what it was doing. There was no doubt that it was a good gas maker and a complete gasification plant. At Blackpool they endeavoured to keep well to the front line in all things. When he first went there he made 20 million cubic feet of gas per annum; now he made 800 million. So that great strides had been made. In concluding his remarks, he called the attention of the members to the great importance of studying the commercial side of the undertaking, and pointed out how the engineer and manager could produce gas and deliver it cheaply, and in spite of all this the balance-sheet show a very different result from what one would expect. He gave a few choice instances where, by a stroke of the pen as it were, a loss had been converted into a gain and so on. It thus behoved them to note these things: "Low price of making, and yet high price of selling."

Mr. WILD spoke of the usefulness of the Junior Associations. He well remembered the formation of the Manchester Junior Association, as he was a lecturer at one of the classes out of which their Association had been formed. He also remarked that he gave the first paper.

Effect of Reduced B.Th.U.

The effects from a gas company's and a consumer's standpoint of a reduction in B.Th.U. were described, in a paper read before the New Jersey Gas Association, by Mr. J. B. Jones, the Superintendent of the Bridgeton Gas Light Company—Bridgeton being a town of 15,000 inhabitants. Early in the period of gradual reduction in the B.Th.U. standard, it became apparent that most of the complaint calls were coming in on account of oven adjustment. When the top of the stove was affected, it was generally in cases where the stove connection was taken from the house pipeline. There were very few calls where the gas was delivered to the appliance under adequate pressure. There was not a single complaint in connection with water-heaters. Very soon it became evident that pressure conditions and an adequate supply were of more importance than the B.Th.U. content; and the Company worked on this theory. In many instances where they found a gas-range connected with a $\frac{3}{8}$-in. pipe, they ran a new $\frac{1}{2}$-in. direct stove-line at their own expense. While the Company's newspaper advertising referred to the reduction in the standard, the men on the district avoided any reference to it whatever. They quickly found that the consumers were not interested in B.Th.U. It took a full two months (with a straight coal-gas plant) to reach the 535 B.Th.U. standard, which had been decided upon as the minimum. The three largest consumers—a big canning concern, works for high-tempering of dies, and a newspaper office with six linotype machines working—never required a single moment's attention. After a comparison of a large number of accounts selected at random, it has been impossible to find any increase in the rate of consumption per meter. It is felt that a rate increase put into effect at the same time may have induced a desire for economy on the part of the consumers; but nevertheless Mr. Jones is convinced that the increase in consumption would in any case have been so slight as to be hardly noticeable. It is his opinion that, with an average pressure of 35-10ths on the inlet side of the meter, and with standard piping conditions on the consumer's premises, any company can render better service with a 525 B.Th.U. gas than was possible under a higher standard of 600 B.Th.U.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The opposition to the South Metropolitan Gas Bill, Waltham and Cheshunt Gas Bill, and the Nelson Corporation Bill having been withdrawn, the orders previously made were discharged, and the Bills committed.

The Tendring Hundred Water and Gas Bill and Wandsworth, Wimbledon and Epsom District Gas Bill: Read a second time and committed.

The South Metropolitan Gas Bill was reported, with amendments.

The South Metropolitan Gas Bill was read the third time and passed, and sent to the Commons.

SOUTH METROPOLITAN GAS BILL.

The South Metropolitan Gas Bill, which was down for hearing before an opposed Committee of the House of Lords to sit on Wednesday last, went off unopposed, and came before the Unopposed Committee of the House of Lords on March 8.

The Bill deals principally with the financial position of the Company, and authorizes the creation of redeemable preference and debenture stock. The only opposition to the measure came from the local authorities of Camberwell, Greenwich, Lambeth, Lewisham, Southwark, Wandsworth, and Woolwich, and was in respect of Clause 16, which reads as follows:

> If at any time the Board of Trade are satisfied that the circumstances within any part of the limits of supply of the Company are such as to render the supply of gas by the Company therein unremunerative, or that it has for any other cause become unreasonable that the Company should be required to supply gas in any such part thereof, the Board may, on the application of the Company and subject to such conditions as the Board may think fit, relieve by Order the Company from the obligation to supply gas in any part of such limits, and, as from the date of any such Order, and so long as any conditions thereby imposed upon the Company are complied with, the Company shall be under no obligation to supply in any part of the said limits specified in such Order.
>
> The costs of any inquiry by the Board under the provisions of this section as certified by a secretary or assistant-secretary of the Board shall be borne and paid by the Company.

This clause was struck out of the Bill; and the opposition was withdrawn.

The Bill was ordered to be returned for third reading.

HOUSE OF COMMONS.

Progress of Bills.

The Radcliffe and District Gas Board Bill is among a group of Bills to be considered by the following Committee: Sir Park Goff (Chairman), Sir Walter de Frece, Captain Tudor-Rees, and Mr. James Wilson.

The Coal Mines (Decontrol) Bill was read a second time, and committed to a Standing Committee.

Public Utilities Companies (Capital Issues) Act.

Copies were presented of reports upon applications to the Board of Trade under the Public Utility Companies (Capital Issues) Act by the Crediton Gas Company, Halstead Gas Company, and the Southampton Gaslight and Coke Company.

Scientific and Industrial Research.

Under Class IV. of the Civil Service estimates for the coming year appear the following items: Scientific and industrial research, £230,000; scientific investigation, &c., £82,000.

Imports and Exports of Dyes and Dyestuffs.

Sir P. LLOYD-GRAEME, in reply to a question by Major Barnes, said the values of the imports into, and exports from, the United Kingdom of dyes and dyestuffs (products of coal tar) registered during the year ended Dec. 31 last were as follows:

Intermediate Coal Tar Products used in the Manufacture of Dyes (including Aniline Oil and Salt, and Phenyl-Glycerine).

Imports.	Exports.	
	Manufactures of the United Kingdom.	Foreign and Colonial Manufactures.
£	£	£
829,810	694,234	70,756

Finished Dye-stuffs obtained from Coal Tar: (a) *Alizarine.* (b) *Indigo, Synthetic* (c) *Other sorts.*

£	£	£
(*a*) 548,528	81,080	244
(*b*) 293,847	264,042	93,925
(*c*) 6,693,109	2,218,777	240,630

MISCELLANEOUS NEWS.

LIMITATION OF INERTS.

BOARD OF TRADE COMMITTEE SITTINGS.

Wednesday, March 9.

The Committee appointed by the Board of Trade under the Gas Regulation Act, 1920, to inquire into the question of whether it is desirable to prescribe a proportion of inerts in gas, sat again on Wednesday of last week. Mr. J. Hunter Gray, K.C., was in the chair; the two other members of the Committee, Mr. W. J. Butterfield and Dr. Lander, also being present. Evidence was heard on behalf of the London County Council—Mr. James Ollis, the Chief Officer of the Public Control Department, and Mr. R. B. James, the Council's Chief Gas Examiner, attending for the purpose.

Mr. Ollis said that samples of the gas supplied by the three London Companies had been taken by the Council from time to time, and showed that the gas supplied during the war varied very considerably. The Council could not help regarding it as a matter of importance, because the time would come, of course, when there would be one general kind of Government for the London area; and it was thought desirable, from this point of view, that the Committee's attention should be drawn to the conditions which the Council's examiners had found to exist. As an example of what he meant, witness handed in figures relating to a large number of undertakings in the Greater London area, which specially referred to Kingston-on-Thames. Samples of the gas supplied by the Kingston Company were tested as the result of the evidence given before the Committee which during the war enquired into the use of coal gas for traction purposes at a time when there was a shortage of petrol. The Kingston gas contained in 1918 32·3 p.ct. of inerts, and the position arose of a vehicle filling-up with gas in the London area where the percentage of inerts, in one case at all events, was much lower, and then, when it was necessary to re-charge, having to use a gas containing a much larger proportion.

The Chairman pointed out that the Woking gas contained, in 1919, 39 p.ct. of inerts.

Mr. Ollis said the tests of gas were carried out by reason of complaints made by those in charge of the Mayford Industrial Schools; and the gas was found to contain an average of 39·1 p.ct. of inerts, as the result of tests carried out on five different occasions between March 10 and 20, 1919. Again, in the Ilford district, the Council had an institution which was supplied by the local gas company. This gas was tested on Nov. 26, 1919, and Jan. 1, 1920. On the first occasion the inerts were found to be 35·7 p.ct., and on the second occasion 30·8 p.ct. The attention of the Company was drawn to the matter, and the Council could not help feeling that, as the result of this, the methods of the Company were improved, because on Feb. 9, 1920, a sample of this Company's gas was found to contain 21·4 p.ct. of inerts. He did not mention these particular cases with any desire to pillory the particular companies named, but merely to bring before the Committee the facts which the Council possessed.

The Chairman asked if witness had formed any idea as to the cause of the existence of these percentages of inerts.

Mr. Ollis said that, speaking generally, the conclusion had been come to that the excess of inerts arose from over-pulling, as set out in the report of the Fuel Research Board. An examination of the gas supplied by the London Companies over many years showed that there had been a gradual diminution in the value of gas. The first change was from 16 to 14 candle power; then, in 1906, there was a variation of the burner for testing; then there was another variation of the statute whereby, for penalty purposes, the gas companies were allowed to take the average of three days. All this had resulted in giving the companies greater freedom, which really amounted to a certain laxity in manufacture; and the tables which he had sent in to the Committee showed that all through the years taken there was a continuous drop in the value of the gas, with a continuous increase in the inerts.

The Chairman pointed out that all the figures which had been put in were on the basis that the consumer was paying for candle power and not for calories. It had occurred to him, he said, that if the consumer paid for calories, as was proposed under the Act, the large percentages of inerts would to a great extent disappear.

Mr. Ollis replied that theoretically it should have this effect; and he assumed that the gas companies recognized that it was to their interest to reduce working costs by reducing the inerts. On the other hand, the companies might find themselves able to reduce working costs by increasing the inerts; and in this case the consumer was damaged, because there was the employment of capital for which the consumer had to pay.

The Chairman: Might that not be more than recompensed by the fact that the consumer is getting a much cheaper supply of gas?

Mr. Ollis said he was not so sure that it was cheaper gas if the excess of inerts in the gas was not necessary to economical production. He was not going to suggest that there ought to be a certain figure to which gas companies should work; but if the inerts were not necessary to economical working, there should be some prohibition placed upon them. Answering further questions, witness said the Council rather took as a standard the operations of the South Metropolitan Gas Company, who roughly worked to a standard of 12 p.ct. of inerts, and a calorific value of 550 or 555 B.Th.U. If an additional 8 p.ct., for example, was added to the inerts, surely the consumer was to some extent damaged.

The Chairman said he appreciated it would be so on the old system of charging; but when the charging was on the heat-unit basis, though the inerts were there, the case against them did not seem to him to be so strong.

Mr. Ollis said he had sent in some extracts from the report of the Gas Investigation Committee of the Institution of Gas Engineers, which went to show that gas was prejudiced by the introduction of unnecessary inerts.*

Mr. James said that the experiments in question were carried out to show the effect of inerts on the efficiency. The figures given in the tables from the report were obtained from the same gas with gradual additions of nitrogen and carbon dioxide separately and together.

The Chairman said that if what these tables showed was the true conclusion to be drawn from the tests, then it seemed to him impossible to say that inerts could not do very much harm. The effect seemed to be very serious. At the same time, he thought the result might be explained by something else.

Dr. Lander suggested that the results obtained were at any rate partly due to the fact that the calorific value had gone down. This was the problem the Committee had to decide—whether the figures in the report of the Gas Investigation Committee were due to the inerts or whether they were due to the fact that the calorific value had been reduced.

The Chairman added that there would be a lower temperature as a consequence of the dilution of the gas with inerts.

Mr. Ollis said he wished to draw particular attention to Table B, which gave figures of the Uddingston gas as taken from the Gas Investigation Committee's second and fourth reports. These showed that it was possible for a gas company under modern conditions to supply a gas with low inerts and at the same time to obtain high yields. Further, the South Metropolitan Gas Company obtained a higher yield per ton of coal than the Gas Light and Coke Company, and yet had a lower inert content. He imagined in the case of the South Metropolitan Company that it was economical manufacture pushed as far as it could be pushed.

The Chairman: Therefore the inerts are not to blame for the low calorific value?

Mr. James said the object in this table was to show that a low percentage of inerts was not inconsistent with obtaining the largest amount possible of the heat energy of the coal in the form of gas.

The Chairman remarked that it was curious that in the tables it did not look as if low inerts connoted low calorific value.

Mr. James said inerts and calorific value did not run together.

Mr. Ollis thought the figures that had been got out in Table F showed that the production of therms at a low cost was not inconsistent with a low percentage of inerts. It was evident from these figures that it was possible to produce cheap therms, and maintain the inerts at a reasonable figure.

Answering some questions by Mr. Butterfield,

Mr. Ollis said the Council had not been able to form any opinions as to the relative value the consumer got in gas when used for different purposes—viz., lighting, heating, and power—taking into account the efficiency of apparatus. All that had been done was to place before the Committee information from the Gas Investigation Committee's reports, from which conclusions could be drawn favourable to the view the London County Council were taking—that the consumer was to some extent injured by the presence of excessive inerts. The Council had not conducted any experiments, and had not made any inquiry which would enable an answer to be given to Mr. Butterfield's question. He should say that fairly reliable figures of the relative uses of gas could be obtained from the gas companies.

Mr. Butterfield pointed out that the experiments of the Gas Investigation Committee were carried out with upright burners in which the effect of inerts would, from theoretical considerations, be expected to be greater than with inverted mantles. With upright burners the injection was upwards, and the burner would necessarily have less injecting power with the same volume of gas sent through the nipple at the same pressure.

Mr. James agreed, as he did also with the suggestion that with inverted burners there would be a greater injecting power under the same conditions.

Mr. Butterfield: Therefore you would not expect to find such big differences with an increased proportion of inerts with inverted burners as were found in the figures of the Investigation Committee?

Mr. James: Possibly not.

Mr. Butterfield said that the work of the Investigation Committee consisted in adding pure nitrogen or pure carbon dioxide to the gas, which would never be done in practice on a commercial scale.

Mr. James said the general point was that the figures showed that a 500 B.Th.U. gas with low inerts was more efficient than the same gas with high inerts.

Mr. Butterfield replied that he did not say this was not so; but he did not get it from the tables. His point was that in the case of the dilution of coal gas with blue water gas or producer gas, the effect must be different from that obtained when adding pure nitrogen or carbon dioxide, because in these diluent gases there was some combustible material. He could conceive that the manager of a gas-works might find himself in the position to produce very cheaply something in the nature of a producer gas containing (say) 60 or 70 p.ct. of inerts. In such a case it would not be fair to take into account the effect of the nitrogen and carbon dioxide in the producer gas separately; but account must be taken of the hydrogen and carbon monoxide which such a gas would contain.

Mr. James agreed that it would be necessary to take account of the combustibles in the producer gas, and also the fact that the mixtures used by the Gas Investigation Committee were artificial mixtures for the particular purpose—not ordinary commercial gas.

Mr. Butterfield asked if Mr. James could draw a line, and say that at such-and-such a point the increase of inerts became serious or a certain percentage of inerts was reasonable, so as to permit the use of new methods of providing fuel gas at the lowest possible cost.

Mr. Ollis suggested that the answer to this question could only be supplied by an independent investigation carried out by the Gas Referees and the Fuel Research Board, because there was no getting away from the fact that the research referred to was carried out by the Institution of Gas Engineers at a time when there was considerable public outcry as to the character of the gas being supplied throughout the country. Therefore, it seemed to him some independent inquiry

* These tables are reproduced on the opposite page.—Ed. J.G.

COMMITTEE ON "INERTS IN GAS."—TABLES HANDED-IN BY MR. OLLIS.

[See Opposite Page.]

TABLE A.—*Showing Details (as Percentages) of Incombustibles in Gas.*

Gas Light and Coke Company.					Commercial Gas Company.					South Metropolitan Gas Company.				
Year.	Incombustibles (Per Cent.).				Year.	Incombustibles (Per Cent.).				Year.	Incombustibles (Per Cent.).			
	CO_2.	O.	N.	Total.		CO_2.	O.	N.	Total.		CO_2.	O.	N.	Total.
1909	1·8	0·4	9·2	11·4	1909	—	—	—	—	1909	1·8	0·3	6·5	8·6
1910	2·7	0·4	11·4	14·5	1910	—	—	—	—	1910	—	—	—	—
1911	2·7	0·5	12·3	15·5	1911	—	—	—	—	1911	1·0	0·4	8·6	10·0
1912	2·9	0·5	14·0	17·4	1912	3·5	0·1	9·3	12·9	1912	1·2	0·3	8·5	10·0
1913	2·8	0·6	13·9	17·3	1913	2·7	0·2	10·7	13·6	1913	1·2	0·3	9·4	10·9
1914	3·3	0·4	13·5	17·2	1914	3·1	0·2	11·7	15·0	1914	1·1	0·3	12·2	13·6
1915	3·4	0·7	15·0	19·1	1915	3·1	0·6	12·4	16·1	1915	1·6	0·4	10·2	12·2
1916	3·5	0·9	16·5	20·9	1916	3·1	0·5	13·3	16·9	1916	1·8	0·5	9·5	11·8
1917	3·1	0·8	16 2	20·1	1917	3·1	0·6	13·8	17·5	1917	1·8	0·5	10·0	12·3
1918	3·4	0·8	15·8	20·0	1918	3·4	0·7	14·4	18·5	1918	1·9	0·6	10·3	12·8
1919	3·4	0·8	16·2	20·4	1919	3·7	0·7	13·7	18·1	1919	1·8	0·5	8·9	11·2
1920	3·5	0·9	16·1	20·5	1920	3·5	0·4	11·7	15·6	1920	1·8	0·4	8·5	10·7

TABLE B.—*Year* 1919.

Company.	Inerts.	Yield of Gas. Cubic Feet per Ton.	Calorific Value B.Th.U. per Cubic Foot.	Yield of B.Th.U. per Ton.
South Metropolitan Gas	11·2	12,275	551·7	6,772,118
Gas Light and Coke	20·4	12,201	475·3	5,799,135
*Uddingston Gas	12·8	30,000	400·0	12,000,000
†Uddingston Gas	11·8	44,250	338·0	14,900,000
	11·9	95,000	305·0	28,975,000

* Second Report of the Gas Investigation Committee. † Fourth Report of the Gas Investigation Committee (p. 37).

TABLE C.—*Showing the Effect of Adding Nitrogen to Coal Gas.*

1	2	3	4	5	6	7	8	9	10	11
Gas.	Percentage of Nitrogen.	Percentage of Inerts (Total).	B.Th.U. Net Consumed per Candle-Hour.	Illuminating Power per Hour per 1000 B.Th.U. Net.	Total Illuminating Power.	Cubic Feet Consumed per Hour.	Illuminating Power per Cubic Foot.	Nipple Pressure in Inches of Water.	B.Th.U. Net Supplied per Hour.	Calorific Value B.Th.U. Net.
AA	4·5	6·8	26 0	38 4	84·5	3·88	21·78	1·18	2200	567
AB	15·6	17·7	25·7	39·0	101·0	5·26	19·20	2·25	2600	494
AC	24·6	26 5	25·4	39·4	118·0	6·65	17·74	4·05	3000	451
AD	31·8	33 5	28·9	34·6	100·4	7·22	13·91	2·87	2900	402
AE	37·6	39·2	34·1	29·3	85 2	7·87	10·82	3·70	2900	369
AF*	46 2	47 6	39·0	25·6	74·3	8·98	8·28	3·54	2900	323
AG*	54·4	55·6	47·7	21·0	63 0	10·89	5·78	5·45	3000	275

* Maximum efficiency not reached.

TABLE D.—*Showing the Effect of Adding Carbon Dioxide to Coal Gas.*

1	2	3	4	5	6	7	8	9	10	11
Gas.	Percentage of Carbon Dioxide.	Percentage of Inerts (Total).	B.Th.U. Net Consumed per Candle Hour.	Illuminating Power per Hour per 1000 B.Th.U. Net.	Total Illuminating Power.	Cubic Feet Consumed per Hour.	Illuminating Power per Cubic Foot.	Nipple Pressure in Inches of Water.	B.Th.U. Net Supplied per Hour.	Calorific Value B.Th.U. Net.
BA.	2·6	7·0	27·7	36·1	83·0	4·01	20·7	1·22	2300	573
BB.	8·8	13·0	30·8	32·5	84·3	4·84	17·42	1·99	2600	537
BC.	15·4	19·2	39·1	25·6	59·0	4·62	12·77	1·16	2300	498
BD*	23 9	27·4	39·7	25·2	75·7	6·70	11·30	2·50	3000	448
BE*	32·2	35·2	52·0	19·2	57·7	7·52	7·67	3·44	3000	399
BF*	47·3	49·9	100·0	10·0	30·0	9·67	3·10	4·65	3000	310

* Maximum efficiency not reached.

TABLE E.—*Showing Effect of Addition of Nitrogen and Carbon Dioxide to Coal Gas on Illuminating Power at Normal Heat Consumption.*

Gas.	Percentage of Nitrogen.	Illuminating Power at Consumption of 2200 B.Th.U. Net per Hour.	Gas.	Percentage of Carbon Dioxide.	Illuminating Power at Consumption of 2200 B.Th.U. Net per Hour.
AA	4·5	84·5	BA	2·6	79·2
AB	15·6	82·5	BB	8·8	68·2
AC	24·6	81·0	BC	15·4	56·0
AD	31·8	72·0	BD	23·9	49·5
AE	37·6	59·4	BE	32·2	37·0
AF	46·2	51 2	BF	47·3	19·0
AG	54·4	39·0	—	—	—

TABLE F.—*Showing Percentages of Inerts, and Prices Charged in Last Quarter of* 1920.

Company.	Inerts.	Price per 1000 C.Ft.	Equivalent Price per Therm.
	Per Cent.	s. d.	d.
South Metropolitan Gas	10·7	—	10·5 (actual)
Commercial Gas	15·6	4 8	11·5
Gas Light and Coke	20·5	4 8	11 9

now by chemists appointed by the Gas Referees or the Fuel Research Board might have a more pacifying effect on the public mind.

The CHAIRMAN: That would be a rather lengthy and expensive inquiry in which we can hardly indulge at the present moment.

Mr. OLLIS: But knowing what human nature is, I cannot help feeling that an absolutely independent inquiry would have good effects.

Dr. LANDER asked if the witnesses were convinced that a limitation of inerts should be based on practice as it exists to-day. If so, would not this tend to prevent development?

Mr. OLLIS said he took it that the Board of Trade would be given power to vary the proportion, on sufficient cause being shown. Supposing it was established that economical manufacture would be advanced by allowing a high proportion of inerts, he took it that the Gas Regulation Act would enable the Board of Trade to deal with it. If a gas company wanted particularly high inerts, it should ask for a Special Order. A high proportion might possibly be allowed in the interests of economical manufacture, subject to inquiry and to its being proved that it was in the interests of the public. On this point, he reiterated that the South Metropolitan Gas Company had for years worked on an average of about 12 p.ct. of inerts, and a calorific value of 500 to 550 B.Th.U. This had been the practice right back in the days of Dr. Carpenter's predecessor, who had stated in Parliament that the proper distillation of Durham coal in his retorts produced gas of 14 candle power, which was equivalent to 550 B.Th.U.

Mr. BUTTERFIELD asked if Mr. Ollis had suggested that the small undertakings throughout the country had the same opportunities of controlling their works in the same scientific way that the South Metropolitan Company had.

Mr. OLLIS said he did not see why not, if the company required their servants to know their business. Years ago the London County Council had a gas-works at one of their institutions, and it was equivalent to the works in many small towns. The gas there was made of a wonderfully uniform character. There was no complaint with regard to it, and no difficulties in its manufacture; and what could be done by the Council's servants could be done by the commercial world.

Mr. JAMES, in the course of some further answers, said that what the companies might gain in production by having a large proportion of inerts, they might lose through increased distribution costs; and the consumer would be no better off. He believed that 30 p.ct. of the total costs in London were represented by distribution. Another point made against gas companies being given perfect freedom in the matter of the percentage of inerts, was that it would make it inconvenient for people moving from one district to another and taking their gas apparatus with them.

Dr. LANDER suggested that there were not a great number of people who had their own gas apparatus.

Mr. OLLIS said there were a great many, because the gas companies recently had made arrangements whereby their consumers changed-over from the hire system to the purchase system.

Mr. BUTTERFIELD said they could not prevent there being a difference of calorific value in different districts, and even a limitation as to the amount of inerts would not prevent a consumer changing from one district to another and finding his apparatus unsuitable.

Mr. OLLIS admitted that this was so.

Dr. LANDER suggested that the only way the limitation of inerts could help in this matter would be in its tendency to standardize calorific values.

Mr. OLLIS could not help feeling that the consumer would be better off if the gas companies did not have absolute freedom.

The Committee then adjourned.

THE CARBON MONOXIDE COMMITTEE.

THIRD DAY.

This Committee sat on Thursday and Friday last, March 10 and 11, to hear further evidence. On March 10 important evidence was given by Prof. J. W. COBB. He was followed by Mr. ROBERT MOND, on behalf of the Fuel Economy Committee of the British Association. On March 11 Mr. F. W. GOODENOUGH, of the Gas Light and Coke Company, gave evidence, after which some departmental evidence was given by Mr. STEVENSON TAYLOR, Senior Engineering Inspector to the Home Office, and Dr. STEVENSON, of the Registrar-General's Department. Sir WILLIAM PEARCE, M.P., presided, and the other members of the Committee were present, with the exception of Mr. W. DOIG GIBB, who had been called to attend a jury in the High Court.

Prof. COBB said that being specially occupied with the study of fuel, and particularly gaseous fuel, he had considered carefully the proposal to limit by legislation the percentage of carbon monoxide permitted in a public gas supply, and would like to put before the Committee reasons why in his opinion any such restriction would be harmful. He said what was called straight coal gas made by the gasification of coal in retorts, and containing up to 10 p.ct. of carbon monoxide, carried only from 20 to 25 p ct. of the total heat value of the coal. This was because the process of manufacture consisted simply in driving-off the volatile matter which the coal contained. The fixed carbon of the coal, representing a much larger percentage of its heating value, was left behind as coke. Since gaseous fuel was so efficient in its application, apart from labour saving, general cleanliness, and freedom from the smoke that resulted from its use, it was very desirable that the percentage of the heat of the coal distributed by means of gas should be increased. At the present time, most of the technical energies of the gas industry were being applied to bring about this desirable development, and if he was not mistaken, development along this line must have been very much in the mind of Sir George Beilby and the Fuel Research Board when they made the recommendation on which the Gas Regulation Act was based. It was a plain fact that the only form in which fixed carbon had been gasified on the manufacturing scale was that of carbon monoxide. It should clearly be understood, therefore, that the limitation of carbon monoxide carried with it directly a corresponding limitation of the gasification of fixed carbon, and was (to any extent to which it became operative) a direct check to the cheapening and extension of public gas supply. The permission of the Gas Regulation Act to distribute gas of lower calorific value, and without intrinsic illuminating power, was, he suggested, intended primarily to allow the gasification of fixed carbon to carbon monoxide, with its consequent economies. It was advisable to bear in mind that the gasification of fixed carbon could be carried out with a higher efficiency of gas production than the carbonization process. The thermal efficiency of gas production for straight coal gas might be taken as 45 to 55 p.ct.; but the fixed carbon could be gasified by steam in the blue water gas process with an efficiency of 70 p.ct. Moreover, the blue water gas plant required was comparatively simple in construction and elastic in operation, allowing a ready response to heavy loads, and therefore particularly adapted to the needs of the immediate future, when the use of gas was extending so rapidly, and construction was apt to be so slow and expensive. It would, then, have very great disadvantages if the extended use of blue water gas plants was in any way to be discouraged. He had been referring more particularly so far to the separate water gas generator used for the gasification of coke after carbonization had been effected in retorts; but this was by no means the only form of plant in which development of the idea of gasifying fixed carbon was finding its embodiment. The steaming of vertical retorts was another form. He had been responsible for the supervision of experiments carried out at Uddingston for a Joint Committee of the Institution of Gas Engineers and the University of Leeds, and investigations into the process of steaming continuous vertical retorts. There, too, fixed carbon was gasified as water gas; and by the use of 45 p.ct. of steam, the gas yield was increased from 11,000 to 23,000 c.ft. per ton. The carbon monoxide rose from 10·3 to 17·9 p.ct. This practice of steaming to the extent to which it was economically sound was likely to become general in the working of continuous vertical retorts.

The CHAIRMAN said it had been suggested that it might be desirable to fix the carbon monoxide at 20 p.ct. This amount apparently would not interfere with the process just referred to by Prof. Cobb?

Prof. COBB replied that it would not, to the point he had mentioned; but the extent to which steaming was economical had not yet been determined, and he would not agree at all to any limit being placed upon the percentage of carbon monoxide. The practice of steaming to the full extent to which it was economically sound, was likely to become general in the working of continuous vertical retorts. This could be taken as being the accepted opinion of the industry; and it was a practice which would become more and more generally adopted. He thought there was little or no doubt about this. Consequently, he wished to emphasize that any limitation of the carbon monoxide might have very serious consequences upon the development of the process. There were, however, continued Prof. Cobb, other forms of plant, some of them made and working, and some of them being designed at the present time, which aimed at complete gasification of the coal, including the fixed carbon, in one process and in one piece of plant. He quoted the composition of gas from a plant of this kind:

——	Up Run.	Down Run.	Mixed with Coal Gas 470 B.Th.U. Total Heat.
	P.Ct.	P.Ct.	P.Ct.
CO_2	5·4	4·6	4·3
O_2	0·3	0·2	1·8
CO	36·1	38·1	16·5
Unsaturated hydrocarbons	0 6	0·4	2·4
CH_4 and H_2	50·6	49·2	63·4 By diff.
N_2	7·0	7·5	11·6 Direct
	100·0	100·0	100 0
Determined calorific value gross	320	332	—

Such plants worked on the principle of carbonizing in the upper portion of a generator, and subjecting the descending coke, when it reached the lower portion, to the action of steam. He did not claim that this form of plant had the established position of the external water gas generator or the vertical retort with steaming; but it was being very carefully watched by all the progressive members of the gas industry, because though it offered some difficulties in design and working, its great possibilities were appreciated. Discouragement of progress along the line of complete gasification would, in his opinion, be a most unfortunate step to take at the present time, and would be opposed entirely in spirit to all that the Gas Regulation Act was attempting to bring about.

The CHAIRMAN: Then you think there is a reasonable prospect of the whole of the carbon in the original coal being gasified?

Prof. COBB thought it was extremely likely to be done during the next few years. He did not think it was possible to be too emphatic in what he had said as to the evil effect of discouraging progress along the line of complete gasification. There were, however, other possibilities which were engaging attention—such as gasification with oxygen. His chief assistant, Mr. Hodsman (Lecturer on Gas Chemistry at the University of Leeds), and himself read a paper last June before the Institution of Gas Engineers, pointing out that there were good reasons for supposing that the price of industrial oxygen would be very materially reduced in the near future, that carbonization or complete gasification with a mixture of oxygen and steam would then become a practical proposition, and that the plant for the purpose would probably be simple in construction and be worked with a gas production efficiency of about 90 p.ct.

The CHAIRMAN asked if Prof. Cobb had any information since last June when his paper was read, which led him to suppose that the indications he then gave with regard to oxygen were more likely to happen.

Prof. COBB said he had no further information about the price of oxygen; but he had received a reprint of a paper read in America,

before the Institution of Gas Engineers there, in which similar calculations were made to those in his own paper; and the technical figures for a complete scheme on similar lines corresponded with those he had previously given. He had not attempted to calculate the figures into money in his paper; but the figures in the American paper were of an extremely promising description. In Switzerland, too, the use of oxygen had been discussed—particularly having regard to the water-power resources of that country, and other countries similarly situated.

The CHAIRMAN: You think water-power resources should help the production of cheap oxygen.

Prof. COBB replied in the affirmative. It was suggested in a paper read in Switzerland, dealing with the subject, that cheap water power could be used for the production of electrolytic oxygen. Answering a question by the Chairman as to the price of oxygen, witness said that in his paper before the Institution of Gas Engineers the costs were calculated out on the basis of various prices of oxygen per 1000 c.ft.; and these latter varied very widely—from 12s. 6d., which would be a prohibitive price for the purpose, down to 1s. 3d., 10d., and 2½d. per 1000 c.ft.; the latter being the figure for the production of oxygen on a very large scale. That was given by Norton, and the production of cheap oxygen was likely to make this process of gas manufacture possible, or more than possible. There had been very great development with gas under compression; and the production of both oxygen and nitrogen during the war had resulted in the technique of gas compression being considerably improved. It was worked especially in the production of helium as an incombustible gas for airships, and the Jefferies-Norton system was worked on a large scale, for separating 0·5 to 1 p.ct. of helium from the natural gas of Texas, which was an extremely severe problem in fractionation.

The CHAIRMAN: Can you give us any idea of what the cost of oxygen should be per 1000 c.ft., to make this process economical? Would it be about 1s.?

Prof. COBB replied that with oxygen at 1s. we should begin to get into a reasonable position.

The CHAIRMAN: And you really suggest (and that is the importance of your evidence) that it is in this direction that the cheapening to the public of gas supply lies? The economical value of a large reduction in the price of gas to the general public is a factor of enormous consequences; and that is what you are now trying to impress upon the Committee?

Prof. COBB: That is the basis of my evidence. Continuing, he said that what he wished to emphasize was that all these processes (established or prospective) depended upon the gasification of fixed carbon and the production of carbon monoxide in quantity; and that they all make for a higher thermal efficiency in working, and, what was of almost equal importance at the present time, for a greater output per unit of plant, with consequent economies in the material of construction and in labour for both erection and operation. It was also to be recognized that the degree to which such a process volatilized carbon as carbon monoxide was the measure of its technical success. Another important point was that the carbon monoxide was itself an invaluable constituent in coal gas. So far as modern researches had gone and opinions had been expressed, they all laid stress upon the special value of carbon monoxide for obtaining a maximum radiating effect when the gas was burned, and upon its particular usefulness in furnace operations. Stress had been laid upon this by Prof. Wheeler recently, at a meeting of the Sheffield Association of Metallurgists and Metallurgical Chemists. Prof. Bone also had insisted upon the fact, in more than one publication, that the furnace efficiency of carbon monoxide was higher than that of hydrogen. Mr. Forshaw, at the University of Leeds, came to the same conclusion as regards lighting with incandescent mantles. His own experiments showed that coal gas mixtures, or blue water gas itself, could readily be used with an efficiency equal to, or a little greater than, that obtainable from coal gas in gas-fires, although the fire would be designed primarily for coal gas. Apart from radiating power, a mixture of carbon monoxide and air had been found to be one in which ignition travels very slowly as compared, for example, with hydrogen, and this made the gas which contained carbon monoxide in quantity give a long flame in the furnace and one less liable to strike-back—both useful properties. This made the presence of carbon monoxide an especially useful constituent of the leaner gases now produced, because, owing to their diminishing content of methane and other hydrocarbons, they would otherwise tend to have a high ignition velocity and to be liable to strike-back on that account. It was plain, he thought from the above, that the development of the gas industry along lines that would secure full economy and efficiency was absolutely conditioned by the permission to introduce carbon monoxide in quantity into the public gas supply, and that moreover the carbon monoxide, when introduced, was not merely to be tolerated but to be welcomed as a constituent of very special value. There was the further consideration of hygiene. In nothing of what he said under this head did he claim to speak in any way as a physiological expert, but only as one interested in the question who had seen a great deal of the use of different gases both in industrial and domestic operations. He had had long works' experience at the Farnley Iron-Works, where he was concerned with producer gases of various kinds, before going to the Leeds University. It had to be recognized that carbon monoxide was a poisonous gas, and that even straight coal gas might contain 10 p.ct. or more of it. Even if there were no carbon monoxide in coal gas as supplied, it would be generated in the flame from the hydrocarbons that were present. Indeed in experiments by Smithells and Ingle (reported in 1892) it was shown that the interconal gases contained more carbon monoxide in the combustion of ethylene than in the combustion of coal gas. The prevention of the escape of carbon monoxide from a flame—whether of hydrocarbon, coal gas, or water gas—depended in every case upon the completeness of combustion; but, fortunately, this was not a very difficult matter. The accidental escape from a flame of carbon monoxide consumed was practically unknown in the appliances of to-day, and he would therefore confine his remarks to the carbon monoxide present in the gas before combustion. He wished to point out that complete freedom from carbon monoxide in public gas supply could not be secured, even if there were none in the gas as distributed, because there was not necessarily security against the presence of carbon monoxide in the flame, unless the gas used was limited to hydrogen, which was inconceivable.

The CHAIRMAN: Your suggestion is that so much carbon monoxide can be generated in the flame that it is not a matter of primary importance what the original constitution of the gas was?

Prof. COBB said that the escape of carbon monoxide from the flame depended upon securing complete combustion. The accidental escape of carbon monoxide unconsumed from a flame was practically unknown in appliances to-day which were used with a flue attachment.

Thursday, March 10.

Continuing his evidence, and speaking as to the hygienic aspect of the use of gas, Prof. COBB said he would be a bold man who would state that the net hygienic advantage would lie with the use of raw coal as against gas, even when the gas contained carbon monoxide, as it obviously would in any case, since such straight coal gas as was made at Uddingston contained over 10 p.ct. Smoke and soot resulting from the combustion of raw coal, it was agreed, caused enormous damage to health; but it was distributed and progressive throughout the whole population, and was less sensational than a few cases of carbon monoxide poisoning. As regards the latter, he had attempted to realize what was the real point at issue. He could not claim to have made any study of statistics; but he could see that the interpretation either of statistics available, or of the results of the experiments made by such a well-known physiological authority as Dr. Haldane, was an exceedingly difficult matter. If it was proposed to limit the composition of gas supply as regards carbon monoxide, it was plain that in the first place total exclusion was impossible because, as already pointed out, coal gas must inevitably contain carbon monoxide in quantity up to 10 p.ct. or more. Nor could it be seriously proposed that the addition of water gas should be prohibited entirely, since this would result in an acute shortage in gas supply for years to come in most of our large cities. Presumably, the question that really arose was something of this kind. If a gas containing 40 p.ct. of carbon monoxide were supplied, instead of one containing 20 p.ct., would the number of accidents and the amount of ill-health resulting be not only increased, but so far increased that restriction to the lower percentage should be imposed, even taking into account the economic advantages which would accompany the upper percentage, and the hygienic advantages which would naturally follow from the more extended replacement of raw coal by gas? It was to his mind impossible to answer this question in the affirmative. There was very little ground to go upon in restriction when the question was regarded in this way. In how many cases of fatal accident, for example, could it with any confidence be said that if the percentage of carbon monoxide present in the gas had been halved, the fatality would not have occurred? The only fatal accident from carbon monoxide poison to which he was witness was in industry, and occurred with a gas containing no more carbon monoxide than might be present in coal gas—from 9 to 10 p.ct. Other gases containing twice or three times that amount of carbon monoxide were in constant use for many years without an accident, while he was in the works he had referred to. In distributing a gas containing an admittedly poisonous constituent like carbon monoxide, a certain amount of risk, of course, must be taken. It had to be taken in the electrical industry, when electricity came to be distributed at any considerable voltage. The risk was taken, or all the advantages of an electrical supply as we knew it to-day would have been lost to civilization. There were methods of countering the risk, however; and in this direction all possible steps should be taken. As regards gas, it might be suggested that the precaution should tend in the direction of first ensuring that the public were fully alive to the fact that an escape of gas was dangerous. He believed this idea to be ingrained already in the minds of the mass of the population, and that this was one reason why, in a country like ours, when nearly every member of the community was subject to the danger through life, an accident was so rare. It would be a mistake to do anything to discourage the idea that a leakage of gas was dangerous, or to encourage the public to suppose that a gas was supplied, or might be supplied, which could be allowed to leak into rooms without bad results. He was once concerned with establishing a producer gas distributing system for use in a large works—largely to replace coal. The principal difficulty in securing safety did not arise from the carbon monoxide content of the gas, which was only 9 to 10 p.ct. (quite possible in coal gas), but from a false impression of immunity. When this impression was once removed they had no further trouble.

The CHAIRMAN said he had in mind at the moment not so much fatal accidents as the effect on the public health generally of small persistent escapes of gas in living rooms.

Prof. COBB replied that he merely wished to emphasize the point that it would be a mistake to discourage the idea that a small escape of gas was dangerous, and that this was intended to cover large as well as small leakages. He had never seen or known of a case in which health had been prejudicially affected as the result of small escapes of gas. He was once concerned with a producer-gas plant in a works, and the difficulty in securing safety did not arise from the carbon monoxide content, which was about 9 or 10 p.ct.

Continuing with the precautions which he suggested, he said the second was to prevent any escape of gas as far as possible. A comparison of the gas-burners and gas-fittings of to-day with those of a past generation showed that this necessity was realized; but it should be insisted upon. He regarded this as of very great importance.

The CHAIRMAN discussed the possibility of danger in the case of a gas reading-lamp with an indiarubber pipe connection. Supposing a person reading in bed turned the gas off at the lamp and not at the main pipe, was there not a danger of leakage occurring through the rubber connection during the night, and being dangerous?

Prof. COBB agreed that there would be a constant and small escape of gas, but it would be found to consist more of hydrogen than of carbon monoxide.

Dr. GRAY said he agreed with this view, and at the same time did not think there would be any leakage unless the rubber was rotten. But there was always the possibility of cracks developing in the rubber pipe. At the same time he should not think anyone would be so unwise as to turn the gas off at the lamp only.

Prof. Cobb said his third recommendation was that it should be made as easy as possible to detect any escape of gas when it occurred. Gas as distributed had, at present, a strong and characteristic smell. Any dilution which had taken place did not seem to have removed its plain warnings; but if need be, it would be possible to make this quality more pronounced. Finally, a proper standard of ventilation should be insisted upon, which would minimize the danger even if a leak occurred and was not detected. For all the reasons he had set out, he suggested that legislative restriction of carbon monoxide in gas for public supply would be a retrograde step, and that, as far as it was believed necessary, to supplement the pressure which the enlightened self-interest of the supplier on the one hand and public opinion on the other hand could bring to bear in securing safety, it should be done by insistence upon freedom from leaks in the system and ventilation of rooms, or of other confined places, in which gas appliances were installed.

Dr. Gray asked if witness would explain more definitely what he meant when he said there was a low efficiency of gas production, and that complete gasification should be encouraged because it led to higher efficiency.

Prof. Cobb said he referred to efficiency as the amount of heat present in the gas as a percentage of the heat in the original coal.

Dr. Gray then mentioned the Uddingston experiments, in which the amount of carbon monoxide was 17·9 p.ct. and the amount of steam 45 p.ct. What proportion of steam, he asked, went through the retorts undecomposed?

Prof. Cobb thought it would probably be a considerable proportion.

Dr. Gray said it would be a matter for the Committee to consider whether any process which allowed a great deal of steam to pass through the retorts undecomposed and to carry away a great deal of heat, was an economical process—whether, in fact, in going to 45 p.ct. of steam, they had not already passed the economical limit.

Prof. Cobb said that the thermal analysis of the gas made at Uddingston showed satisfactory results.

Dr. Gray: I think the statement that to impose a limit of 20 p.ct. of carbon monoxide would seriously interfere with development can hardly be accepted without some modification. You would not be inclined to say it would be a serious inconvenience?

Prof. Cobb replied that it would be a very serious matter to impose any limitation because we were not sure as to how far steaming in vertical retorts could proceed with economical advantage.

Dr. Gray then dealt with the question of oxygen and asked whether Prof. Cobb thought it likely that using fuel as we must for the liquefaction of the air for the separation of oxygen, would enable it to be produced cheaply enough for the purpose indicated.

Prof. Cobb thought it could, because the developments which were taking place in the production of oxygen were such that the expenditure of power necessary was becoming very much less, and the main cost of production would be in the plant and not in the fuel.

Dr. Gray said he had asked the question because he had received an emphatic contradiction from an authoritative source; but he could see the possibility where the separation of the oxygen from the air was associated with the utilization of the nitrogen. He supposed Prof. Cobb had had that in mind.

Prof. Cobb said he had. One of the main sources of his information was the report of the Nitrogen Products Committee.

Dr. Gray: If the nitrogen is utilized for the production of ammonia by the Haber or some similar process, that will liberate a considerable amount of free oxygen which might be used in the way you suggest?

Prof. Cobb: Yes. That, of course, would be largely a local matter. The production of nitrogen would not be carried out in all the towns, but in one or two centres, and this would mean the distribution of the oxygen through expensive pipes.

The Chairman thought Dr. Gray was quite right when he said that the production of oxygen would be in one or two large centres. Would it be possible, he asked, to distribute oxygen through pipes?

Prof. Cobb thought that was a matter which would have to work itself out.

Answering some questions as to carbon monoxide in the flame, Prof. Cobb said he considered that if the flame was allowed to develop completely, the escape of carbon monoxide from the flame was negligible. Indeed, any escape was highly improbable if the combustion was complete.

Dr. Gray thought they were all agreed that it was desirable to give the gas industry every possible freedom with regard to carbon monoxide, but there was the question of the safety of the public to be balanced against the economic advantages; and they had to consider the possibility of a gas rich in carbon monoxide being very much more dangerous on account of accidental escapes. He gathered that Prof. Cobb held the view that it would be possible to prevent that.

Prof. Cobb: Yes

Dr. Gray: Then what steps do you suggest should be taken in order to make this, for practical purposes, impossible?

Prof. Cobb: I would rather not make suggestions more definite than those already given.

Dr. Gray: You would leave it to the gas industry to suggest methods of preventing such escapes. I do not think there is any doubt that a gas with 40 p.ct. of carbon monoxide is more dangerous to distribute than a gas containing 10 to 20 p.ct.; and we have been informed by Dr. Haldane that the risk is not in direct proportion to the increase in carbon monoxide, but in a very much greater ratio.

Prof. Cobb said it must be remembered that the risk existed with any gas. It was not a risk arising from the fact that the particular gas referred to by Dr. Gray contained carbon monoxide, because carbon monoxide was inevitable in any gas. A great deal could be done, and was being done, to improve the fittings; and things were different in this respect to-day from what they were a few years ago.

Dr. Carnwath asked if by the change from the cubic foot to the thermal basis, there would be an increase in the carbon monoxide.

Prof. Cobb replied that he thought so and hoped so. As to preventing the increase of carbon monoxide before the precautions which he had outlined had been put into operation, if the Committee did not think sufficient precautions were being taken it would be better to insist on more being done in this way than to attempt to obtain security which he believed would be illusorily secured) by insisting on a low percentage of carbon monoxide in the gas.

Dr. Carnwath: You deprecate the regulation of the carbon monoxide limit because we are not certain of the economic limit. Would not you accept the converse proposition—that it would be bad not to impose a limit on the carbon monoxide because we are not certain as to the danger of it?

Prof. Cobb said he certainly would not accept that because it would seem to be deliberately setting-out to check the development of the industry on account of some hypothetical evil which might follow in its train.

In the afternoon,

Mr. Robert Mond gave evidence on behalf of the British Association Fuel Economy Committee. He said that, although the matter of gas supply was being considered by many experts, his Committee felt that there was nobody who had taken the consumer into account, and it was from this point of view that he gave evidence. While the Committee heartily welcomed the change to the therm in the method of charging, he felt that the mere declaration of a calorific value by the gas undertaking, under the Act of 1920, was not sufficient to ensure a suitable gas for the purposes of the domestic consumer with whom the Committee were solely concerned. A suitable gas for domestic consumption should be, as far as possible, non-poisonous; and it should be readily combustible, and not easily extinguishable. Prof. Bone's researches on the explosive limits of different gases had shown that hydrogen and carbon monoxide, which formed some of the main constituents of the gas proposed to be used, had a very wide explosive range, whereas methane and ethylene, and some of the smaller constituents, had a small range. Therefore, if there was not enough methane, or if it was totally excluded from the gas, as would be the case with straight water gas, the gas would be both dangerous as regards explosion and difficult to keep alight. It would easily lead to back-firing. He had been discussing this matter with the Chairman of the Toronto Consumers Gas Company, where, during the war, the gas was reduced to 350 B.Th.U., and there were continual complaints of the gas back-firing and going out. It was then found that there was not so much danger in the back-firing of the gas as in its going out and escaping into the rooms of the consumers. The British Association Fuel Economy Committee, therefore, had come to the conclusion that no gas was safe which did not contain 20 p.ct. of methane. This would permit of a mixture of half water gas and half coal gas, and would automatically reduce the carbon monoxide to about 20 p.ct. From the evidence that the British Association Committee had on the subject, it was not thought advisable to go beyond 20 p.ct. of carbon monoxide. When Parliament considered the Mond Gas Bill many years ago, the limit of carbon monoxide was fixed at 14 p.ct., after a Special Committee (containing, among others, Mr Vernon Harcourt and Dr. Haldane) had reported; and there had been very few accidents from carbon monoxide poisoning. At the present time, the gas sent out by gas undertakings was too delicate, so to speak, for use in the appliances available.

Dr. Gray pointed out that, under the Act of 1920, the onus was on the gas undertakings to adjust the apparatus to burn the particular gas supplied.

Mr. Mond said his remark applied to present apparatus, because gas was regarded as the heating agent of the future and any legislation passed now must be based on a greatly extended use of gas.

Dr. Gray thought witness had not grasped the point of his question. Did he mean to say that it would not be possible to adjust the present-day fittings to burn a gas with considerably less than 20 p.ct. of methane? Serviceable apparatus could be made to burn straight water gas, and it was only a question of adjustment of the nozzles and the pressure of supply.

Mr. Mond said that they had on the British Association Committee Mr. H. James Yates, who was one of the largest manufacturers of gas-stoves; and he had agreed with the views he (Mr. Mond) had expressed. The difficulty was that they were dealing with a poisonous gas, if it contained carbon monoxide, and what was aimed at by the Committtee was to prevent the gas getting into the room by too easily lighting-back and going out, and so escaping.

Dr. Gray: Suppose the gas companies had to adjust the fittings to suit their particular gas, would that remove your objection?

Mr. Mond agreed that it would; and he added that the Committee had done their level best to make suggestions which would not be too onerous on the companies.

The Chairman, referring to the statement by witness that gas was looked upon as the heating agent of the future, said that all the representatives of the gas industry who had been before the Committee had pleaded for an extension of the percentage of carbon monoxide, and had stated that complete gasification was almost the only way they could make gas financially attractive as a heating medium. The gas industry, with one accord, took the opposite opinion to that expressed by witness.

Mr. Mond reminded the Committee that if they limited themselves only to the gas-works part of the business, he agreed that the production of water gas was cheaper; but this was not the only thing to be considered. Distribution costs came into the account.

The Chairman thought this was a matter which could be left to regulate itself.

Mr. Mond replied that he wished to make the point that it was not merely a question of making the gas cheaper. [At this point he handed to the Committee curves showing the inflammability of various gases, as obtained by Prof. Bone.]

Dr. Gray said these brought them back to the question of adjusting apparatus. If this could be done, the objection disappeared.

Mr. Mond agreed.

Dr. Carnwath pointed out that a lot of gas companies were supplying 50 p.ct. of water gas and that there were no reports of an unusual number of accidents in their districts.

Mr. Mond assented; but he added that the Act of 1920 was very wide, and allowed gas companies to declare any thermal value for the gas they wished to supply.

Dr. Gray asked if there was any objection to a company's supplying

any sort of gas, so long as they gave as good service with it as they did at present—apart from the poisonous nature of the gas.

Mr. MOND admitted that he could see no reasonable objection to adopting any gas in a new town where the supply was being given for the first time; but in existing towns there would be a hybrid system if a very low calorific value was declared under the Act.

Dr. GRAY asked if witness's point was that a higher pressure would be dangerous because it might cause leakage.

Mr. MOND said that the higher pressure would cause serious leakage, as the distributing system was not designed for it.

The CHAIRMAN: In a new town and with new appliances, you would not propose to limit the carbon monoxide?

Mr. MOND: No, I do not think personally I would. My difficulty is that in old towns the gas would have to be sent through pipes which are naturally leaky, and burned in apparatus which is worse.

Dr. GRAY: We are informed that there has been such a marked improvement in fittings in recent years that this danger has practically disappeared.

Mr. MOND: The danger has got very much better, I admit. Answering further questions, he said the improvement in fittings was one reason why he agreed to 20 p.ct. of carbon monoxide instead of the 12 p.ct. now generally accepted; but he wished to lay stress on the necessity for having some methane in the gas—for the reasons he had already stated. The British Association Committee were also strongly of opinion that there should be a standard pressure.

Dr. GRAY: I believe that is provided for under the Act.

The CHAIRMAN put it to witness that the representatives of the gas industry who had come before the Committee had unanimously said that 20 p.ct. of carbon monoxide would be a serious handicap to the industry. If witness were a gas manager, would he be satisfied from the gas manufacturer's point of view to distribute a gas with 20 p.ct. of carbon monoxide?

Mr. MOND said he was only a manufacturer of Mond gas and was not in a position to give an opinion on this matter.

The CHAIRMAN pointed out to Mr. Mond the views expressed by Dr. Carpenter as to the difficulty in disposing of coke, and the advantage complete gasification had in this respect, as well as in others, and asked if he contested this view.

Mr. MOND said he was aware of this view, but did not agree with it, because complete gasification brought them into the region of inerts and a large expense on mains for distributing such a gas.

The CHAIRMAN suggested that gas companies would not adopt a gas which would involve them in an undue increase of expense on that account.

Dr. CARNWATH asked if, apart from liability to explosion, witness had any evidence that a gas containing a large percentage of carbon monoxide had ill-effects as regards public health.

Mr. MOND said he was afraid he had not any specific body of evidence. They knew, however, that carbon monoxide was a poisonous gas, and it was easy to get headaches and general inconvenience from small doses of it. He knew that Prof. Bone had suffered from it.

The CHAIRMAN: What you want to impress upon the Committee, I take it, is that in the opinion of yourself and your Association, in the interest of the public, gas should contain at least 20 p.ct. of methane and not above 20 p.ct. of carbon monoxide. That is the fact you want us to take into consideration?

Mr. MOND: Yes. That is our opinion. We think that is a possible way of making gas fool-proof for the domestic consumer.

The CHAIRMAN: At the same time, I rather gather you think that, from the economic point of view, if the process was scientifically treated these percentages would be no detriment?

Mr. MOND: That is so. We do not think there is very much in it either way; and we do not think the percentages mentioned would be any hardship on the industry.

The Committee then adjourned until next day.

Friday, March 11.

Mr. F. W. GOODENOUGH, the Controller of Gas Sales to the Gas Light and Coke Company, Chairman of the Executive Committee of the British Commercial Gas Association, and Hon. Joint Secretary of the National Gas Council, said that in the eighteen years during which he had been engaged in the work of improving service to the gas consumer and, by that and other means, of popularizing the use of gas, the sale of gas in the area supplied by the Gas Light and Coke Company had increased from 22,300 to 32,000 million c.ft. Stated in periods of six years, the increases had been:

6 years ended	1908	1700	millions
6 ,, ,,	1914	2800	,,
6 ,, ,,	1920	5200	,,

In that period the purchasers of gas in the district had increased from 244,500 to 327,000 using ordinary meters, and from 140,000 to 516,000 using slot meters—*i.e.*, in all from 384,500 to 843,000, or an increase of 458,500 purchasers, representing (say) 2½ million more persons using gas than in 1902. Gas appliances sold or let on hire to consumers during the same period had increased from 275,000 to 1,078,000. In spite of the number of persons using gas having considerably more than doubled—mainly among the poorer classes, who until the advent of the slot-meter could not enjoy the advantages of a gas supply, and had to use the dangerous cheap oil-lamp, who were at first necessarily unfamiliar with the proper use of gas-burners and appliances, and who were least careful in their handling of such fittings—there had been in his experience no corresponding increase, but rather a decrease, in fatal accidents due to the inhalation of gas.

The CHAIRMAN said the Committee were satisfied that the fatal accidents were extremely small; but he desired to know whether there had been any deleterious effect on the public health from public gas supplies.

Mr. GOODENOUGH said he had absolutely no evidence to that effect, and he had no reason to think that there had been. He hoped to be able to satisfy the Committee on the point because he was absolutely convinced of it himself. Had the contrary been the case he should have been the first to advocate any practical means for reducing the risk to the user, as nothing could be more prejudicial to the development of gas sales than increasing fatalities due to its use. On the other hand, for reasons related directly to the public health, he was strongly opposed to any restrictions upon the manufacture or distribution of gas that would increase its cost, and so prevent the further development of its use, unless these restrictions were clearly proved to be essential to public safety, and were not based merely upon hypothesis and prophecy, unrelated to practical experience. The Committee had had evidence as to the number of accidents due to the inhalation of gas in the Company's district during the past ten years—one per annum per two million persons using gas; and he need not repeat the details. But he could add that no evidence had come to his knowledge during those years of any deleterious effect on the health of—and certainly none of fatal results to—the large number of fitters working under his direction, who had frequently to work with "live gas," as they called it, in fixing and exchanging meters, clearing stoppages in supply pipes, and making connections to existing supplies. This immunity had been experienced in spite of the fact that to an increasing degree the gas supplied had contained a considerable percentage of carburetted water gas and therefore of carbon monoxide.

The CHAIRMAN: This experience rather goes to show that your opinion is that small escapes of gas are not things to which accidents can be attributed?

Mr. GOODENOUGH: That is so. In his further evidence, he said he attributed the reduced and now extremely small number of fatal and non-fatal accidents due to the inhalation of gas (he excluded suicides entirely) to the changed circumstances and conditions which led him also to feel confident that accidents would not be in any material degree increased were the percentage of carbon monoxide in the gas much higher than it was at present. The following were the changes in circumstances and conditions that led to diminished risk of accidents connected with the use of gas. In the first place, there was now—thanks to the slot meter—a much wider knowledge of the uses of gas than there was twenty years ago, especially among the class from which domestic servants were drawn. Accidents which in former years were due to young servants who had had no acquaintance with gas in their homes misusing it on first being employed in houses where it was installed, were much more rare, as most girls now going out to service had become familar with gas in their homes and had been taught its use in cookery or laundry classes at school. School children were, moreover, now frequently invited to visit gas-works or show-rooms, and were annually invited to enter, and did enter in thousands, for competitions dealing with gas. Further, many teachers had been, and the majority soon would be, provided through the agency of the British Commercial Gas Association, with notes for lessons on the manufacture, distribution, and utilization of gas. To an ever-increasing degree the rising generations were being familiarized with gas, and at the same time were made acquainted with the need for care in its use.

The CHAIRMAN expressed his interest in the competitions, and asked how they were carried on.

Mr. GOODENOUGH said that advertisements were published in all the educational papers calling the attention of teachers and children to the competitions. Great interest was taken in them, and prizes were awarded in the local districts, as well as generally.

Continuing his description of the present-day circumstances surrounding the use of gas, Mr. Goodenough said that the substitution of incandescent mantle-burners for open-flame burners had reduced very materially, and would practically eliminate, the risk of gas being "blown out" instead of turned-out. If there were any risk of incandescent burners being blown out (and in his opinion there was none), the quantity of gas that would escape was less than in the case of an open-flame burner. He was surprised to read in a report of Dr. Haldane's evidence before the Committee that he had said that four-fifths of the accidents were due to burners being left on in bedrooms. If this was so in former years, it certainly had not been the case during later years, because very few accidents had arisen from this cause.

Dr. GRAY asked what were now the main causes of accidents from gas?

Mr. GOODENOUGH said that Mr. Goulden had given the figures of fatal accidents on the Gas Light and Coke Company's system—viz., fifteen. Of these, five were due to the fracture of a large main, three only were due to taps and fittings (which was one-fifth instead of four-fifths), two were due to water-sealed chandeliers, and five to sundry defects in fittings. With regard to the question of the escape from a lighting burner when the tap was left on, he could not see that one incandescent burner left on in a room could bring about a poisonous atmosphere at breathing level, because the gas rose, and diffused through the walls and ceilings. The diffusing power of gas had often been demonstrated by the late Prof. Vivian Lewes by putting a brick over a pipe containing gas and then, in a few seconds, being able to light the gas on the other side of the brick.

Dr. GRAY suggested that a brick was more porous than a plaster ceiling.

Mr. GOODENOUGH agreed, but added that the walls and ceilings of houses were very porous, especially jerry-built houses. Then there was the dying-out of the water-sealed chandelier, which the Gas Light and Coke Company and other companies had condemned for many years. This had reduced, and its complete disappearance would further reduce, the risk of serious gas escapes. Next, the periodical installation and inspection and maintenance of gas fittings and appliances by skilled workmen employed by gas undertakings was becoming more and more general, and tended to decreased risk of leakages of gas. The installation and maintenance of slot-meter gas supplies, too, by or under the direct supervision of gas undertakings, had led to a very low risk of escape from defective pipes and fittings. It was now the practice of most gas companies to become the gas-fitters in their districts. The handyman employed by the ironmonger now did less and less work in installing gas-appliances, and this had resulted in gas-appliances being installed in a much better way than before.

The CHAIRMAN: Do you mean to say that the ordinary consumer can call upon the gas company to put in an installation or see to it?—Certainly.

Do you encourage that?—Yes.

How does it pay the gas company?—It pays the gas company to

see that the consumer gets good service and a thoroughly efficient installation.

The Chairman said that was a good sound view, but it was not always the view in industry.

Mr. Goodenough said his Company, and the Association which he represented, which covered practically the whole of the country, based their policy on good service to the consumer, because in this way the gas companies got in the end much better service.

Dr. Carnwath asked what proportion of apparatus on the whole the gas companies installed.

Mr. Goodenough said that during the past eighteen years the number of gas-appliances in the district of the Gas Light and Coke Company had increased from 275,000 to 1,078,000; and these had all been installed by the Company. In many parts of the Company's district there were no local gas-fitters. One could not be found if wanted, and the public preferred to go to the gas company. When the local gas-fitter had done his job, he had finished; but the gas company had a secondary and much more important business, and its work had only commenced when the apparatus had been installed. His Company supplied mantles when asked to. In the case of slot-meter installations, there was a periodical inspection of the fittings.

The Chairman: That is not the practice all over the country.

Mr. Goodenough said it was very largely. The inspections of slot-meter installations were carried out about once in two years; but a representative of the company was in the house every two weeks, clearing money out of the meter; and if there were any complaints as to leaks, &c., they were made to him and reported to the office.

The Chairman suggested that working-class people might be inclined to allow a dilapidated mantle to remain on the burner, and thus nullify the effect of the inspection.

Mr. Goodenough pointed out that this would have no effect on safety, but would merely result in a poor service. Even if there was no mantle at all, there would be no greater danger, because a perfectly burning flame could still be obtained.

Passing on to further new conditions, reference was made to the improved education and training of gas-fitters, in connection with which the establishment of examinations in "Gas Supply and Gas Fittings" by the City and Guilds of London Institute, and of the certification of gas-fitters by the Institution of Gas Engineers, as having raised the standard of workmanship, and correspondingly reduced the risk of accident. In the case of his own Company, they had a regular apprenticeship scheme in gas-fitting. The fitters were paid by the day, and usually there were 1200 permanently in the employ of the Company. Just at present, the number was rather less, because there was not so much installation work being carried out. Finally, the better quality of fittings and taps used was another factor in reducing risk. The tendency in coming years would be for these factors to have an even greater and a cumulative influence in increasing the safety of gas supply. This would render restrictions upon the toxic strength of the gas distributed even less necessary than in the past—always assuming that the gas was sufficiently odorous for its presence in the air to be readily detected, as the presence of coal-gas ensures that it will be.

Answering the Chairman, as to the amount of coal gas that was necessary in a gas mixture to render a leak readily detected,

Mr. Goodenough said he had not made tests, but it was a very small amount. A bye-pass to a mantle, if it was blown-out and remained "on," very soon made itself apparent, and the amount of gas flowing was only one-fifth of a foot per hour. Such an escape would soon be detected, because coal gas was extremely pungent. If the gas mixture contained a low percentage of coal gas—say 5 p.ct.—the escape to be serious would have to be several cubic feet per hour. He did not think it was intended to supply a straight water gas, and a very small percentage of coal gas would quickly indicate the fact that there was a leak, if the gas was escaping. Any mixture that gas companies would send out would be sufficiently strong in smell to be detected at once if there was a leak. It would be quite unnecessary to put an artificial odour to a gas containing even a small percentage of coal gas. Continuing, he said that the evidence laid before the Committee had gone to prove that restrictions upon the use of water gas would tend to increase (or to hinder any reduction in) the price of gas, and would tend to diminish its efficiency in use. It was the hope of the industry that the freedom conferred upon it by the Gas Regulation Act would result in the cheapening of gas, and in its greatly extended use for domestic and industrial purposes. Although there had been a considerable extension in the use of gas instead of crude coal in recent years, every indication went to show that there was a good prospect of a still greater increase in gas consumption in the near future, unless the cost of gas was increased, or maintained at an unduly high figure, by unnecessary restrictions.

The Chairman: By that you mean that, unless some cheapening in the cost of gas is effected, the use of gas might possibly be restricted?—Yes. Obviously the higher the price of gas the less is it likely to be used; so that if restrictions were placed on the manufacture of gas which led to a higher price, it would be detrimental to its use.

I suppose it is hardly fair to ask you what sort of reduction you see in sight if you had a free hand?—I am afraid I am not in a position to say.

Mr. Goodenough went on to state that, on grounds of public health and economy—quite apart from the question of the interests of the gas consumer or gas supplier—it was of great importance that every encouragement should be given to, and certainly no avoidable obstacle placed in the way of, the substitution of gaseous fuel for crude coal; and this had been emphasized by the interim report of the Departmental Committee on the Abatement of Smoke and Noxious Vapours, a copy of which was handed to the Committee. In this connection emphasis was laid by witness upon the effect on public health of fogs in increasing respiratory diseases, and that, in fact, danger from the poisonous nature of foggy atmospheres was far greater in its effects upon the public health than the danger of carbon monoxide poisoning. It was straining at a gnat after swallowing the camel to suggest restrictions on the gas industry (in which the deaths from accident had been very small) which would have the effect of diminishing the use of gas when it was seen in the report handed in that it was essential for the use of gas to be increased, in order to purify the atmosphere and prevent a very much larger number of deaths which it had been shown were directly attributable to fog.

Continuing, Mr. Goodenough remarked that it had been stated in evidence before the Departmental Committee on Smoke Abatement, after the publication of its interim report, that since coal smoke was abolished in New York by legislation fifteen years ago, the death-rate there from pulmonary tuberculosis had been reduced by 66 p.ct. It had been shown that in the eighteen years, 1902 to 1920, the use of gas for fuel in London had increased enormously—from 22,300 to 32,000 million c.ft. in the area of the Gas Light and Coke Company alone. In the same period, the death-rate fell from 17·3 to 12·4 per thousand inhabitants. The hours of sunshine recorded in Westminster during the winter six months rose from an average of 227 hours in the five years 1901-5 to 310 hours in the five years 1916-20. In Glasgow, the consumption of gas rose from 5700 million c.ft. in 1902 to 7200 million in 1920. In the same period, the death-rate fell from 20·4 to 15·3. It was not suggested that the fall in the death-rates was wholly or mainly attributable to the reduced pollution of the atmosphere. But there could be no doubt that the mitigation of the fog peril, due to the increased use of gas for fuel and of gas and electricity for power, had been an important factor in the improvement of public health. Cities needed pure air as well as pure water to make them healthy. Apart from the effects on public health arising from the purification of the atmosphere of towns and cities, there were other advantages to health accruing from the use of gaseous fuel instead of crude coal—namely, those arising from decreased drudgery in the home; greater safeguards against sickness and greater facilities for dealing with sickness when it occurs; decreased dirt in the home; and improved working conditions for employees in workshops and factories. On the economic side, moreover, there were to be secured by the use of gas, saving of damage to public buildings; saving of transport; saving of coal; increased and improved output per employee and per square foot of factory; and saving in the cost of buildings, both domestic and industrial. The obvious conclusion to be drawn from these facts was that the clearest and most certain proof—proof based upon experience and not on theory—must be forthcoming to justify any fresh restriction upon the development of the gas industry, or any hindrance to its supplying the public with heat units at the lowest possible price. If any altered policy in the gas industry should lead (as he did not anticipate) to an increase in accidents due to the inhalation of gas, the industry would, in its own interests, revise such policy without waiting for statutory restriction.

The Chairman remarked that it could be taken that the Committee were in favour of not doing anything that would hinder the increased use of gas, provided there was no risk to the public.

Mr. Goodenough replied that his evidence had been directed to the point that there was no such risk.

Answering questions by Dr. Gray, as to the life of employees of gas companies, Mr. Goodenough repeated some of the facts mentioned by Mr. Goulden as to the old age of servants of his Company.

Dr. Carnwath asked if a rapid increase in the percentage of water gas was contemplated.

Mr. Goodenough said that was a matter of engineering policy; his business was to sell gas to the public. As to the suggestion that had been made that it would be wise to impose restrictions now and review the situation in five or ten years time, he thought it would be better to wait five or ten years before doing anything in order to see what the situation was then—giving the industry a free hand meanwhile. The precautions which he had advocated were now being taken, and the whole attitude of the industry towards the maintenance of installations had undergone a great change from what it was twenty years ago, when there was a fear of taking such responsibility. The change was due entirely to the recognition by the industry that it was good business to see that the consumer secured good service. This policy had been very much fostered by the British Commercial Gas Association.

Dr. Carnwath: You do not contend that the standard of the Gas Light and Coke Company is maintained throughout the country?

Mr. Goodenough said that, without being egotistical on behalf of his own Company, he agreed; but the standard throughout the country had risen very substantially, and was still rising.

The Chairman: There is no security as far as the consumer is concerned that if you had complete freedom you might drop this policy.

Mr. Goodenough: The security is that it has proved to be good business to look after the consumer. It has been proved that giving good service to the consumer is a very valuable commercial asset to the undertakings; and there is not the slightest reason for their dropping what has proved to be such a valuable asset.

In answer to some other questions, Mr. Goodenough said he would not care to distribute a straight water gas, because there was not sufficient smell to indicate an escape. If it was used, then something must be mixed with it to make its presence indicated in case of leakage.

Finally, Mr. Goodenough informed the Committee that the British Commercial Gas Association had issued a standard specification for installation work; and this would help to bring about a higher standard of efficiency. The specification had already been approved by the Ministry of Health.

In the afternoon, two witnesses gave evidence.

Mr. Stevenson Taylor (Senior Engineering Inspector of Factories, Home Office) said that the total number of cases of carbon monoxide gassing which had been reported for the five-year period 1908-1912, inclusive, was 316, of which 40 were fatal, while for the period 1913-1919 (also a five-year period, because no figures for 1914 and 1915 were included), the total number of such cases was 359, of which 59 were fatalities. These figures, however, did not by any means include the total number of cases, as there were a large number in which, for instance, men working at blast-furnaces got what they called a whiff of gas, and were taken out into the fresh air for a short time, or were treated at the works' surgery or ambulance room and recovered and returned to work the same day. As a matter of fact, there was a considerable slackness in reporting cases of this kind; so that the real figures were higher than those shown by the reported cases. Of those that were reported, however, it was to be seen that the number of

fatal cases had increased from 12·7 p.ct. in the first period to 16·4 p.ct. in the second period.

In answer to the CHAIRMAN, he agreed that these figures were not very impressive ones. With regard to the causes of accidents from carbon monoxide, he thought they were very largely due to ignorance of the danger of it, and the inodorous nature of the gas.

The CHAIRMAN said this hardly applied to the problem which the Committee had under consideration, because the evidence which had been placed before the Committee was to the effect that with a proportion of coal gas an escape was always noticeable.

Mr. TAYLOR (continuing) said another cause of trouble from carbon monoxide was the lack of respiratory appliances in connection with the operation of furnace plant, &c. In Mond gas, the tests made by the Inspectors of the Department showed 11 p.ct. of carbon monoxide, 24 p.ct. in Dowson gas, and 34 p.ct. in suction gas. In operating these plants, there was danger from lack of proper ventilation when the men were cleaning; and cases often arose in connection with the starting-up of engines—gas getting back into the engine room through leaks. Another cause was due to the exhaust gases from the vent-pipe blowing back from outside through the windows of workrooms, where the vent-pipe was not taken a sufficient distance away. Accidents were also due to defective valves and defective water-seals.

The CHAIRMAN asked witness whether it was fair to compare the situation in connection with the working of producer-gas plants with coal gas, if coal gas was being used in gas-engines. Would there not be greater risk with producer gas containing 34 p.ct. of carbon monoxide than with coal gas, which contained from 10 to 15 p.ct.?

Mr. TAYLOR agreed that there was greater risk with producer gas; but if coal gas were distributed containing a larger percentage of carbon monoxide than that mentioned by the Chairman, he would expect accidents from gassing with carbon monoxide to increase in consequence. Experiments had been carried out by the Inspectors of the department in cases where complaints had been made—such as in laundries, where producer gas was used for heating calendars, irons, &c.; and it had been found that the atmosphere near the apparatus contained from 6·6 to 8·6 volumes of carbon monoxide per 10,000, as compared with 0·2 and 0·8 per 10,000 with coal gas. It was only by maintaining a very high standard of ventilation that the purity of the atmosphere could be secured in rooms of this nature. Witness admitted that the tests carried out were comparatively few, and had only been made where complaints had been sent in. It was usually found that the proprietors of these laundries had used producer gas for general purposes of heating, although the producer gas was originally not put down for the purpose. He admitted that it was not a very common practice for producer gas to be used in laundries.

In answer to the CHAIRMAN, witness said that the experiments he had referred to had been carried out before the war, and had not been followed up since. His point, however, was that the high percentage of carbon monoxide in producer gas created considerable ill-effects upon the health of the workers; and if coal gas were distributed containing a high percentage of carbon monoxide, it was natural to infer that the same effects would follow. He admitted, however, that the majority of cases of gassing from coal gas were in connection with gas-works, and that the cases of gassing in ordinary factories using coal gas were comparatively rare. Even in the gas-works, the accidents happened through inadvertence, although accidents had happened from cracked pipes, leaky fittings, and defective joints.

The CHAIRMAN reminded witness that Dr. Haldane had suggested a limitation of 20 p.ct. of carbon monoxide; but that the gas industry was pleading for complete freedom to be able to increase the percentage of carbon monoxide, in order to obtain the greatest economies from the system of manufacture.

Mr. TAYLOR replied that, from his experience in factories, he should say that if the percentage of carbon monoxide were increased to something comparable with the amount now in producer gas, the cases of carbon monoxide poisoning in factories would undoubtedly increase.

The CHAIRMAN: What about houses?—I should think in houses, too.

Then you think, from the public health point of view, there is an objection to increasing the percentage of carbon monoxide above 20?—I should think so, very seriously. I think myself 20 p.ct. is quite high enough, and that it would certainly involve a considerable increase in cases of carbon monoxide poisoning if this figure were exceeded.

Is that sufficient to put against the real economical saving which the industry would probably derive in being allowed to use a higher percentage?—I am not in a position to say; but there is a great deal of producer gas of the Mond type being used, and blast-furnace gas and coke-oven gas, containing less than 20 p.ct. of carbon monoxide. Our experience in places like laundries and other factories has been that where the amount of carbon monoxide has been increased, the accidents have also increased. He added that improved ventilation would prevent cases of carbon monoxide poisoning in many instances.

Mr. W. DOIG GIBB mentioned that the Home Office had power to specify improved ventilation.

Mr. TAYLOR said that was so in the case of factories; but in many instances improved ventilation could only be secured by mechanical means.

In answer to Dr. GRAY, witness said that Mond gas did not contain more than 14 p.ct. of carbon monoxide, and there were very few cases of gassing from it where it was used in South Staffordshire. A recent test of Mond gas showed that the actual amount of carbon monoxide was 10 p.ct. This figure, however, was given him by the chemist, and was not obtained by an actual test by the department. Even so, however, there had been one case in the Midlands in connection with the grinding of edge-tools, where the factory had turned over from coal fires to Mond gas, and the men asked the management to prohibit the use of gas on account of its effect upon their health. It might have been, of course, that the men used the gas improperly; but it all went to show that it needed very careful handling.

Dr. GRAY put it to witness that producer gas was odourless, whereas the gas supplied to domestic houses was not, and was much more easily detected in case of an escape.

The CHAIRMAN said that the problem the Committee had to consider was that of domestic supply.

Mr. TAYLOR agreed that the amount of gas likely to escape in a private house was very much less than it would be in a factory; but he was, nevertheless, convinced that if the percentage of carbon monoxide were increased, the danger would be increased; and for this reason he felt there was a risk in going beyond 20 p.ct.

Mr. W. DOIG GIBB: Why do you put that limit on it?

Mr. TAYLOR replied that 20 p.ct. was the figure which had been put to him as being suggested by Dr. Haldane; and he had accepted it because it was rather more than double the present percentage. He was aware, as put to him by Dr. Gray, that the percentage was higher than even 20 p.ct. in some towns, but they were comparatively few.

Mr. W. DOIG GIBB asked witness if he did not think it all boiled-down to this—that with greater care, and increasing education of people in the use of gas, the position was not such a serious one?

Mr. TAYLOR agreed that greater care and proper education would help to reduce the number of cases; but he did not think it would eliminate the cases that were undoubtedly purely accidental. The Home Office would certainly insist on improved ventilation in factories where a higher percentage of carbon monoxide was used. At the same time, one great difficulty was to get the ventilating arrangements maintained efficiently in factories.

Mr. W. DOIG GIBB said that from a manufacturer's point of view, he knew how difficult it was to get people to apply all the orders that were given in this respect; but there was an increasing tendency in factories to take greater precautions against leakage of gas. Would witness suggest that a slight increase in the danger from the use of a higher percentage of carbon monoxide was sufficient to justify imposing restrictions upon the manufacture of gas which might materially increase the cost both for domestic and industrial uses?

Mr. TAYLOR replied that he presumed the gas industry would not go beyond 30 p.ct. of carbon monoxide; but what the difference between that and 20 p.ct. would be as an economic question was difficult to judge.

The CHAIRMAN said that the proposition was to go beyond 30 p.ct. in some districts in the future; and that must not be ruled-out.

Dr. STEVENSON (from the Registrar-General's Department) handed in to the Committee statistics from the records of accidents, suicides, and murders, which were attributed to coal gas—dating back to 1875. Based on a list of towns supplied by the Secretary of the Committee, he had prepared a table of areas supplying a high proportion of carbon monoxide and a low proportion of carbon monoxide, with a view to ascertaining the relative fatalities in the two classes of area. The high proportion of carbon monoxide areas were those supplying gas containing 20 p.ct. of carbon monoxide and over; while the figure for the areas supplying a gas with a low proportion of carbon monoxide was from 6 to 8 p.ct. The result of this investigation was that the number of fatalities was greater in the areas supplying a higher proportion of carbon monoxide than in the areas supplying a low proportion. Witness said he drew no conclusion from the result, but merely placed the facts before the Committee, although it would seem to follow that an increase of carbon monoxide involved an increase of fatalities. He was only concerned with the fatalities, and not with the general effect of carbon monoxide upon the public health. At the same time, he fully agreed that the figures were exceedingly small—viz., 1.9 per million of the population in the low carbon monoxide areas and 4·5 in the high carbon monoxide areas, over a period of seven years. These figures related to accidents only, and not to suicides.

In answer to Dr. GRAY, witness said there was no distinction in the returns between accidents in factories and accidents in private houses.

Mr. W. DOIG GIBB put it to witness that one big accident would make an absolutely artificial result when considering the figures over a period.

Dr. STEVENSON agreed, but added that he was not aware of any such accidents in the figures he had been dealing with.

The CHAIRMAN asked if witness thought the deaths were sufficiently numerous to make them a matter of real consequence, when placed against the economic advantages which the gas industry had urged would follow if they had complete freedom.

Dr. STEVENSON said that with such an exceedingly low death-rate it was very difficult to say what importance should be attached to it from the point of view suggested by the Chairman; but he would like to point out that the death-rate was increasing.

Dr. GRAY said the population also had increased.

Dr. STEVENSON replied that thirty years ago no deaths from coal gas poisoning were reported at all, although he was rather inclined to suspect the returns in this respect. It was probable that there were more deaths from coal gas poisoning than were actually reported.

Dr. GRAY called attention to the fact that the deaths were exceedingly small, notwithstanding that the carbon monoxide had increased from 6 p.ct. to something like 20 p.ct. in some cases.

Mr. W. DOIG GIBB pointed out that many of the cases given in the returns included factories where there was producer-gas plant.

Dr. STEVENSON replied that there was no indication in the returns of whether the deaths were due to coal gas or producer gas. They were all put under the heading of coal gas.

Answering Dr. CARNWATH, witness said it was not for him to say whether there had been any compensating advantages to the public to be set-off against the accidents; but he presumed the circulation of a cheap form of gas was an advantage from the public point of view. He again admitted that the figures of accidents were extremely low.

Dr. CARNWATH: It would be very convenient to analyze them into industrial and domestic cases; but apparently it is impossible?

Dr. STEVENSON: I am afraid so.

There has been a tremendous increase in the amount of producer gas used for industrial purposes?—Yes.

The CHAIRMAN asked if the Registrar-General's Department had any information as to America. Some American cities were supplied with straight water gas; and any information on this point would be valuable.

Dr. STEVENSON: The figures could only be obtained by going through the American reports.

The CHAIRMAN: America seems to have taken the risk. If you have any figures it would help the Committee.

Dr. Stevenson was not very hopeful of finding figures as to the effect of gas, because gas was a very small cause of death; and he doubted whether special figures relating to it were published. He would, however, try to find out.

The Chairman said there was another aspect, apart from deaths—namely, that a small escape of gas, according to some of the evidence, reduced public vitality.

Dr. Stevenson said he was not able to deal with that.

Mr. W. Doig Gibb asked if the record cards of the Registrar-General included a heading "Producer Gas."

Dr. Stevenson replied that they did not; and he imagined that cases of death from producer gas were all included under the heading of coal gas.

RICHMOND GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the shareholders of the Richmond Gas Company was held on Thursday, the 3rd inst.—Mr. Henry Pullman, J.P. (the Chairman), presiding.

The Chairman's Remarks.

The Chairman, in moving the adoption of the reports and accounts, said: In submitting the half-yearly accounts, I desire to call your attention to a few of the principal items appearing in the revenue account for the half year under review, as compared with the corresponding period of 1919. The sale of gas amounts to £50,017 19s. 9d., as against £41,075 15s. 11d.—an increase of £8942 3s. 10d. The rental from meters, stoves, and fittings shows a slight decrease of £245 2s. 2d. Coke sales amount to £16,057 6s. 4d., against £15,176 5s. 9d.—an increase of £881 0s. 7d., owing to slightly better prices ruling. Tar has produced £3147 14s. 7d. extra, mainly as a result of the benefit derived from our contract for the surplus tar, under a sliding-scale. The advent of the new year, however, has revealed a fall in the price. Sulphate of ammonia receipts show an increase of £961 9s. 8d., principally due to a much better make; and thus the revenue from all sources has resulted in an increase of £14,504 17s. 3d. Turning to expenditure, we find that the cost of coal is £39,154 17s. 6d., as against £31,060 0s. 1d., an increase of £8094 17s. 5d., due to higher prices and larger quantities used. Purification shows an increase of £450 0s. 2d., principally due to the receipts from spent oxide having fallen. Manufacturing wages happily reveal a decrease of £801 8s. 5d. Repairs and maintenance must of necessity show an increase; the figure being £4583 9s. 11d. As regards repairs and maintenance, we are faced with an "extra" of £1753 19s. 4d.; and here it is the oft-repeated tale "due to extra cost of material and higher wages." Rent, rates, and taxes have advanced by £61 6s. 7d. Summing up, the revenue account reveals a balance, being gross profit, of £4393 0s. 1d., which, after providing for fixed charges and allowing for a dividend of 3¾ p.ct. per annum, leaves a surplus on the half-year's working of £110 3s. 8d., which, added to the undivided profits brought forward from June 30, 1920 (a total of £3478 11s. 11d.), is carried forward.

The Present and Future Prospects.

Having referred in particular to the working of the Company, I should like to add a few words respecting the present and future prospects. At the present time we are in a state of transition, and, being so, it is not easy to give a forecast. The Directors have, in the interests of the shareholders and consumers, thought it wise to make early application for the benefits which are to be obtained under the Gas Regulation Act; and this has been done. Under this Act gas will cease to be sold by cubic feet; but, instead, the actual heating value only will be charged. I do not wish to worry you with technical details; but the useful content of gas is its heating power, which can be ascertained by an instrument called a calorimeter. In future gas will be so tested; and a continual record will be made under the observation of an examiner appointed by the Board of Trade. This apparatus indicates and records the heating power of the gas in units. It has been decided to call 100,000 of these units a "therm," as the basis of the charge; and the gas will be charged for in therms, instead of in cubic feet. The heating quality of the gas being thus known, and the meter having registered the number of feet which have been consumed, a simple calculation will indicate the number of therms which have been supplied in that number of cubic feet; and this charge on the account will be at so much per therm. You will therefore see that only as a basis will the number of cubic feet registered be used, and that only the heating capacity of the gas will be paid for. Under the old system, gas companies were tied hand and foot to a certain quality of gas, and thus were prevented from improving plant with the object of reducing the cost of production. It is quite likely that gas of lower heating value may be cheaper to produce, out of all proportion to its quality, and consequently can be sold at a price which is greatly to the advantage of the consumer. Though more cubic feet may be registered on the meter, the correction for heating value will reduce his bill to its correct value; and he will get all the benefit from the economy. A certain amount of opposition to this and other companies' applications has been received from the authorities; but this was not unexpected. On principle, public authorities, I say with great respect, are partial, and oppose any movement on the part of public utility companies, thinking thereby that they are protecting the interests of the public. The Board of Trade, however, are reported to be handling the application under the Gas Regulation Act in a very fair spirit, while listening to the more or less unreasonable criticisms of opponents.

Condition of the Residuals Market.

I am sorry to say the residuals markets are not in a good condition, and give cause for concern. When we last met, the coke market was very flourishing, chiefly owing to the great demand from the Continent. About the end of the year—and quite suddenly—the Continent ceased buying, with the result that the home market, having the extra quantity to bear, has considerably fallen. The coal strike is responsible for this; for when Western Europe saw that what looked like a long stoppage of the mines was imminent, they took large deliveries from America and Norway, and consequently now have no use for ours. Sulphate of ammonia is falling in value to a great extent, due to the competition of Germany, who is supplying freely at prices we are unable to touch—and this in spite of the depreciation of the exchange.

An Acknowledgment of Good Work.

Considerable advance has been made in the renewals at the works, in the face of great difficulty in obtaining material; and here a tribute to the untiring energy and conspicuous ability of our Engineer and Manager (Mr. E. George Hutchinson) is due alike from Directors and shareholders. It has to be remembered, also, that during the war practically no repairs could be carried out, as the Government would not sanction the use of raw material. It is obvious, therefore, that a considerable amount of leeway has to be overtaken, and this at a cost exceeding three times that of pre-war prices. It is not, then, to be wondered at that the price of gas is relatively high compared with prices in 1914; but it is a very satisfactory and healthy sign that the demand for gas is greater than ever, and the advantages of its use in so many ways are now understood. If the country will only settle down to sound finance such as can meet the keen competition of the markets of the world, the future will be bright indeed; and with a re-organization of the gas industry under the Gas Regulation Act, the prospect is hopeful. May we soon return to pre-war dividends, and a pre-war spirit of prosperity. [Applause.] Needless for me, I trust, to conclude by saying that the advancing of the interests of this Company is the first aim of each and all your Directors. With these observations, I have now the pleasure to move that the report and accounts as presented be received, adopted, and entered upon the minutes.

Dr. Ward seconded, and the resolution was agreed to.

The Dividend.

The Chairman then moved that a dividend of 3¾ p.ct. be declared.

Col. Powell, in seconding, said they would have been better satisfied if the dividend had been larger. He hoped that between this and the next meeting the Board of Trade would have granted them the powers they were asking for under the Gas Regulation Act. The Company, being under the sliding-scale, could only pay in accordance with the price of gas. At present they were paying the minimum that any company could be called upon to pay. There was an attempt by one of the great London boroughs to interfere with the powers of the Board of Trade to grant the concessions they were asking for, on the ground that these powers were improperly used; but he hoped they would not succeed. The Richmond Corporation kept a keen eye on the Gas Company. Certain criticisms had been made by the councillors which were perfectly fair; and he did not think that either the Directors or the shareholders had any reason to complain of the way in which they had been met by the Richmond Corporation. He was perfectly sure no Richmond councillor or consumer wished to enter upon a policy of confiscation. The shareholders were entitled to a reasonable and proper return for their money; and 3¾ p.ct. was not a large dividend. No one could say that 5 or 5⅛ p.ct. was not a reasonable rate. Before the next meeting he hoped they would be authorized to pay a rate to which they were really entitled.

The motion was agreed to.

The Chairman then moved the re-election of Dr. George H. Rodman and Mr. L. R. Abbey-Williams to the directorate. They had been through, and they were going through, most difficult times; and he could vouch for the excellent services of these gentlemen.

Mr. J. Doherty seconded, and, on behalf of the Board, desired to say how pleased they were to see the Chairman back again. He wanted to tell the shareholders how, all through the whole time of his very serious illness, the Chairman had constantly kept in touch with the management of the Company. This showed what great interest he had in it.

The proposal was agreed to; and Dr. Rodman and Mr. Abbey-Williams replied briefly, thanking the shareholders for their confidence in them.

Mr. C. R. King was, on the proposal of Mr. Symmons, seconded by Mr. Coombs, reappointed Auditor, and returned thanks.

Votes of Thanks.

Mr. Walters proposed a hearty vote of thanks to the Directors, and said that, while things were satisfactory, he hoped that the swing of the pendulum would bring the better times back again.

Mr. P. Umney seconded, and expressed the hope that Col. Powell would not be a false prophet, and they would have an increased dividend next year. The amount this year was very small; and they would like to have more if they could get it.

The Chairman thanked the proprietors for this mark of their confidence. They all desired to do their very best. He wanted to say also how much they were indebted to the staff for the able and loyal support they had given during the year. Thanks were due to Mr. Hutchinson for the great services he had rendered to the Company, and also to Mr. Gooderham and the office staff. They had all worked very loyally together; and he proposed a vote of thanks to them.

Mr. Rodman seconded, and the vote was cordially passed.

Messrs. Hutchinson and Gooderham responded; the former speaking of the way the staff at the works were getting closer together, and of the manner in which the Directors had always supported him.

Ownership of the Cambuslang Gas-Works.—At an extraordinary general meeting of the shareholders of the Cambuslang Gas Company, Ltd., Mr. John J. Auld (the Chairman) intimated that the Lanark County Council had made an offer for the purchase of the works. After discussion, it was unanimously agreed to accept the offer. It was stated that the County Council would pay all expenses applicable to the carrying on of the Company's business as from April 30 last, including a sum of £500 as fees to the Directors for any services they might have rendered subsequent to that period. It was agreed by the shareholders to pay £500 to the nine Directors as an honorarium for past services; and the shareholders authorized the Directors to pay to the officials an honorarium in respect of loss of office on the transfer of the undertaking.

HARROW AND STANMORE GAS COMPANY.

Satisfactory Increase in Sales.

The Ordinary Half-Yearly Meeting of the Company was held on Monday of last week, at No. 5, Great Winchester Street, E.C.—Mr. A. F. PHILLIPS (the Chairman) presiding.

The ENGINEER and SECRETARY (Mr. Charles Chambers) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said that the sale of gas throughout the Company's district continued to show a satisfactory increase. It was for the half year ended Dec. 31 237 million c.ft., which was 5 p.ct. more than in the corresponding half of the previous year. The capital account showed that there had in the period under review been an expenditure on plant, mains, and meters of £5866, from which was deducted £3124 for depreciation, resulting in an increase in the capital expenditure of £2742, and leaving the total capital expended at £240,340, equal to 10s. 2d. per 1000 c.ft. of gas sold. From the revenue account, it would be seen that the gas and meter rental was £66,640, against £50,339 the previous year; the price of gas being 5s. 2d. per 1000 c.ft.—an average increase of 1s. 2d. on the year before. Residual products realized £17,063, against £10,682 the previous year; the sale of coke being particularly good. On the expenditure side of the account, coal, oil, and coke for producing the gas had gone up from £26,591 in 1919 to £38,777. Carbonizing wages had increased from £3370 to £4236; repairs of works, from £6415 to £9385; repairs of mains and services, from £5398 to £7448; repairs of meters and stoves, from £4564 to £6296; and rates, from £2320 to £3185. All other charges had remained much the same. The balance carried to profit and loss was £8573, against £7841 in the corresponding period. After providing for interest on borrowed money and income-tax, there was a balance of profit and loss of £12,420. The proposed dividends would absorb £4784 of this, leaving £7636 to carry forward to the next account. The works had been well maintained; but, as mentioned in the report, an extension of the coal carbonizing plant would be necessary to meet the ever-increasing consumption of gas. Further purifying plant might also be advisable. The additions that had been made to the carburetted water-gas plant would enable the Company to furnish all the gas likely to be required next winter. The work throughout the half year had been most efficient; but it had not been carried on without considerable anxiety, requiring the unremitting attention of the Company's manager and staff. It had not at all times been easy to obtain coal, and some of it had been of inferior quality. Labour had not given so much trouble as at some other works; but it required constant consideration. He might point out to them that the wages paid during the past half year were £16,052, against £4650 the last corresponding half year before the war. Of course, there had been an increase in the quantity of gas sold.

THE COKE MARKET.

The Company had been fortunate in the price they had realized for coke. It was in some measure due to this that he was able to present to the proprietors such a favourable revenue account. It was, however, well to bear in mind that the state of the market was changing, and coke was not so easily disposed of, unless at considerably reduced prices. For some time the large gas companies were exporting any coke to the Continent. This took vast quantities of coke out of the English market, and enabled sellers to maintain a high price for that left for disposal. This state of affairs changed at the end of last year. The demand for coke for export ceased, with the result that accumulations were taking place in England, which would be thrown on the market at greatly reduced prices. This might have a very serious effect on the revenue of gas companies, and lead to increases in the price of gas.

MISAPPREHENSION AS TO THE THERM BASIS.

It was not possible to form a reliable opinion on the coal supply of the future, and what might be the effect of the Government's control ceasing. The outlook at present was far from satisfactory. It was coal and labour that gave gas undertakings so much anxiety. One could only hope for the best. The Company had made an application under the Gas Regulation Act for the sale of gas on the heat-unit basis at per therm; and they expected to obtain such terms as would enable the Company to return to dividends equal to those paid before the war. Gas shareholders had been very long-suffering in the loss of interest on their capital, at a time when interest on capital generally had been increasing. It was poor consideration the nation had given to the gas industry, which (as so often had been stated) sacrificed much to produce what was vital for the manufacture of munitions for the successful prosecution of the war. Let them hope that some slight recognition might now be obtained for all they had done, while sustaining such serious reductions in their dividends. The general public did not appear to be very clear as to the effect of changing the basis of charge from cubic feet to therms. Many were under the impression that the price demanded per therm would be that charged. It was not so. The standard price per therm took the place of the standard price per 1000 c.ft.; and as it was proposed that the sliding-scale should still operate, the gas must be sold at under the standard price per therm to enable a company to pay any increase in the dividend beyond the normal 5 p.ct. As this Company paid a dividend of 5½ p.ct. before the war, it would be evident that the gas must be sold at a price per therm less than the standard, according to the provision that might be contained in the Order. No alteration in the operation of the sliding-scale was contemplated. As indicating the benefit conferred upon the consumers, he might point out that, to pay an increase of 2s. 6d. p.ct. dividend for a half year, the shareholders received £142, while the reduced price of gas gave the consumers £988. The old sliding-scale, based on a standard price per 1000 c.ft., did good service in the past; but times and conditions had become so abnormal since the great war, that it must be replaced by a more suitable and just standard. When the old standard was accepted, it was impossible to foresee the position of to-day. It was only right that the claims of those who had carried on the business at considerable loss for the past six years should receive justice. He concluded by moving the adoption of the report and statement of accounts.

The VICE-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion, which was unanimously passed without discussion.

OTHER BUSINESS.

On the proposition of the CHAIRMAN, seconded by Mr. A. M. PADDON, dividends were declared for the half year ended Dec. 31 at the rates of 3¾ p.ct. per annum on the ordinary stock and 5 p.ct. per annum on the preference stock—both less income-tax.

The CHAIRMAN, in proposing the re-election of Dr. Glaisher as a Director, said he believed that gentleman had been a member of the Board for over thirty years. At the time he became a Director the make of gas was 30 million c.ft. per annum, whereas it was now nearly 500 millions. Thus during his period of service Dr. Glaisher had witnessed a great development of the business. His advice and assistance were always most valuable.

Mr. PADDON, who seconded, remarked that it was an honour to the shareholders and the Company to have so distinguished a Director as Dr. Glaisher.

Dr. GLAISHER, in acknowledgment, said he did not suppose any company was more efficiently managed than was this one. With Mr. Phillips and Mr. Chambers always at hand, there was very little he could do as a Director.

The retiring Auditor (Mr. James Randall) was also re-appointed.

Mr. E. L. BURTON said they had listened to a statement which was in many respects a very excellent one. The Company had been particularly fortunate in having secured the accession of business that had been reported; and in various other ways they were to be congratulated. They were all aware that the administration and management of the Company were in most excellent hands; and he hoped it might be very long before there was any change. They owed to Mr. Phillips, the Directors, officers, and staff their best thanks for the efforts they had made during the past half year in promoting their interests; and he moved that such a vote be accorded.

Mr. J. W. BUCKLEY, in seconding, said it had been his pleasure and privilege to know for a very long time the members of the Board; and it would be hard to find anyone more capable to preside over a gas company. It was with deep regret that they noted the absence from the meeting of their old friend Mr. Samuel Cutler; and they sincerely trusted he would soon be better.

The CHAIRMAN thanked the proprietors for the vote, and added that Mr. Cutler had asked him to express his regret at his enforced absence in consequence of a cold.

Mr. CHAMBERS also acknowledged the vote on behalf of himself and the staff. The approbation of such a Board, comprised of technical men, was, he remarked, very thoroughly appreciated. At Harrow, they were particularly fortunate in their staff. It was seldom that they had any changes; and each one was perfectly loyal, and did his utmost at all times for the interests of the Company.

TYNEMOUTH GAS COMPANY.

The Annual Meeting of the Company, which was held at North Shields on Monday of last week, was presided over by Mr. J. B. WILLIAMSON.

The CHAIRMAN, in moving the adoption of the report and accounts, said the revenue for the year 1920 was £221,637, and the expenditure £213,786, leaving a balance of £7851 as profit. To this was added the balance of £2252 brought forward from the previous year—leaving £10,103 to be dealt with. The dividend of 3¾ p.ct. taken on the whole year absorbed £6865; leaving a balance of £3238 to carry forward—an increase of £986 on the year. It was thought well to write-down war stock by taking £601 from the reserve fund account; but, as £520 was transferred at the same time from the balance brought forward, the reserve stood within £80 of what it was. The net addition to capital account for the past year was about £8800, which had mostly been spent on the new 8-in. trunk main to Whitley, and on additional plant at the works. The capital accounts were now overspent by more than £33,000. As further capital expenditure must be incurred this year, it had been decided to take advantage of the powers given by the Public Utility Companies' (Capital Issues) Act, 1920, whereby the permissible proportion of loan capital was increased from one-third to one-half of the stock capital issued; and their application for an Order under the Act had already been sent in to the Board of Trade. The necessary steps had also been taken to prepare their application to the Board of Trade for an Order under the above-named Act, which would eventually take the place of the Temporary Increase of Charges Order. It was anticipated that under the Order they should be restored to their pre-war financial position, by the raising of their maximum selling price, without suffering any reduction of dividend. The Act would provide for a new basis of charge, whereby gas would be sold on the thermal or heat-unit basis, instead of by volume as at present. Residual products—coke, tar, and sulphate of ammonia—had realized £116,790—an increase over the previous year of £33,900. These returns had more than paid their coal bill by £23,000; and when it was observed what large sums had been required for replacements and repairs, much of which had to be deferred during the war, it would be seen how important a place residuals had taken in the year's work. The output of gas showed an increase over the previous year of 6½ p.ct., the quantity manufactured amounting to 690,000,000 c.ft. Wages and salaries under the heading of manufacture and distribution had increased by £7650, or about 26 p.ct. over the previous year. Coal had cost £93,500, an increase of £22,700, or 32 p.ct. over the previous year. During a great part of last year they were paying £1 15s. 4½d. per ton, as compared with 13s. 9½d. per ton during the twelve months immediately preceding the war. This was equivalent to an increase of about 2s. per 1000 c.ft. of gas sold. If they added the enormous increase in the cost of all materials, and the various increases in wages, it would be found that, had it not been for econo-

mies effected, and the much higher prices obtained for residuals, instead of the price of gas averaging as it did about 3s. 3d. throughout the year, it would have cost the consumers something like 5s. 3d. per 1000 c.ft., compared with 2s. 2d. before the war. During the year an important extension of mains between the works and Monkseaton, started before the war, had been completed, and Preston Village, Monkseaton, and Whitley areas were now receiving additional supplies. As soon as circumstances permit, it was intended to carry this main to Seaton Delaval. Certain extensions to existing mains had just been completed for the Percy Main and New York areas, all of which would materially improve the district pressures, and tend to give an increased output of gas for cooking, heating, and lighting.

The report was adopted; and dividends of 3⅞ p.ct. and 4 p.ct. respectively on consolidated and new ordinary stock and preference stock were declared.

RADIATION, LIMITED.

Annual Meeting.

The Annual Meeting of shareholders was held in Birmingham last Friday—Mr. H. James Yates (the Chairman) presiding. The report presented will be found in last week's "Journal" [p. 625].

The Chairman, in moving the adoption of the report and accounts, said it would probably be generally agreed that the past year had been one almost unexampled in industrial and commercial experience. At the beginning of the year, trade was booming in all directions; while towards the end of the year it underwent a remarkable change for the worse. Notwithstanding this, however, it was with much gratification that the Directors found themselves able to submit a balance-sheet which, considering the great difficulties passed through, was a very satisfactory one, and that they were able to maintain the same rate of dividend as that which was declared a year ago. In the latter part of 1920, an arrangement was made with Messrs. Wilsons and Mathiesons, Ltd., the well-known gas-stove makers and iron founders, of Leeds, whose high reputation was doubtless familiar to many of the shareholders, for their joining forces with Radiation, Ltd.; and the Directors were particularly gratified that this remaining leading firm in the industry were now incorporated with their Company. Most of the Directors had personally known the Directors and a number of the officials of Messrs. Wilsons and Mathiesons for many years; and they had every reason to look forward with pleasure to the prospect of the most valuable co-operation with them as colleagues in time to come.

Prices in Relation to Research.

He had referred to the fact that Radiation, Ltd., embraced the leading firms in the gas industry; and it was well known and recognized within the industry that, as regarded goods of the class which their various concerns manufactured, those who wanted the best that could be made were always safest and wisest to apply to one or other of the Radiation firms. It was equally well recognized that those who wanted the best could expect the highest-class goods at the lowest-class price. In apparatus of the kinds and for the purposes with which the Company's manufacture was concerned, the outstanding requirement was efficiency. Their purpose and practice was to make, not apparatus that would sell at the lowest possible price, but that which would give the best results attainable with the smallest amount of fuel for which this could be achieved. To this end the efforts of all their research chemists and experimenters were continuously directed; and the magnitude and cost of this work, carried on by a staff having highly specialized scientific attainments, would be difficult for outsiders to realize. Without work of this kind, which had been carried on by Radiation firms for a considerable period of years, it was not too much to say that the domestic and industrial users of gas would not be in a position approaching that which they occupied to-day. Not only had this pioneer constructive work been carried on, but educative work by lectures, papers, and other means was a prominent feature of the efforts to which the energy of the Directors and officials was steadily devoted. All this work was quite apart from the actual cost of labour and material in the production and finishing of the apparatus; but it was as truly essential to ensuring that the apparatus should be of the highest attainable efficiency as were the quality of materials and the mechanical processes involved in their production—to say nothing of its value in popularizing the use of gas apparatus. It followed, therefore, that the costs of this highly developed apparatus of theirs was substantially greater than that of apparatus made by ordinary industrial methods. Equally with the technical efficiency of the apparatus, the maintenance of all materials throughout at the highest quality was the constant Radiation policy; and all materials which lent themselves to it were subjected to daily analysis. At the present time materials could be bought—in many cases owing to the rate of exchange with Continental countries—at cheaper prices than similar materials actually cost their Company; but these materials were not suitable to the maintenance of the high-quality goods for which their Company stood. From these considerations, it would be appreciated that theirs was one of those not infrequent cases in which the price of the article was not the only factor—and, indeed, was not the real deciding factor—as to its worth or suitability. An apparatus which was uneconomical in use, and not durable in quality, might be much more costly than another apparatus intended for the same purpose which was higher in price, but more efficient, economical, and durable. Notwithstanding, however, that they made it their business to give such high-class materials and finish, and that they spent so much and so constantly in ensuring maximum up-to-dateness and efficiency in their apparatus, their prices were low, consistent with the quality they were supplying. It would be neither good sense nor good business to suggest that apparatus which had had put into it the result of costly research work should be expected to be charged at the price of castings. Brains must be paid for, as well as brawn; and to refuse to do so, or to elude doing it, would simply mean that research and inventive ingenuity would be driven into other channels, and would permanently forsake the gas industry—to the no small detriment of the industry's best interests.

Standardization.

Already the standardization of all parts common to gas-fires for the Radiation firms had been accomplished; and they were now engaged in further developing domestic gas-cookers also on the interchangeability basis. They hoped to be in a position before long to offer to the public gas-cookers with many advantages over the types that had been generally used in past years, and showing greatly increased economy in daily use. The business of the various Radiation concerns covered many trades; but the interests of the Company lay in a great measure within the gas industry, and in this connection the programme they had mapped-out for themselves was an extensive one, and would be gradually developed during the next few years to the general advantage—as was confidently believed—of this Company, of the gas undertakings, and of the gas-consuming public. The necessity for such a standardization programme could hardly be overstated. They were pressing forward with their standard slot-cooker for fitting into small dwellings, and hoped in a short time to place on the market a cooker which would give such a degree of efficiency, and be sold at such a low figure, that they would look forward to meeting successfully any possible competition either at home or abroad. The Company were looking to the prospect of continued co-operation with their customers and friends—the gas undertakings throughout the country. They valued the advantage of the special experience which they possessed on their side of the industry; and, on the other hand, the Directors desired that the gas undertakings should have the benefit of their experience and resources as manufacturers. He believed that the key to the great future success he anticipated for the gas industry lay in cordial co-operation between all sections of the community.

Industrial Apparatus.

The Chairman then proceeded to deal with unemployment, wages, restricted output, and other questions, and went on to say that the importance of the use of gas for industrial purposes was now firmly established; and the various firms associated with Radiation were competent to deal with appliances for every process of heat-treatment, ranging from the tiny table crucible for the laboratory or the goldsmith, up to the largest furnace for taking charges of many tons for steel works or shipyards. The various foundry departments had been supplying a large proportion of cooking, warming, and hot-water apparatus in connection with the present housing schemes of the Director of Building Materials Supply. One important thing which they had in view, and which was calculated to further not only their own advantage, but the wider interests of the industry as well, was that they intended to go in for a big effort to further educate the public as to the great usefulness and value of domestic gas apparatus for cooking, warming, and hot-water supply, and they would enter upon this part of their programme as soon as the suitable moment arrived.

Mr. John Coxon seconded the adoption of the report, and said the fusion of interests in Radiation, Ltd., was not arranged to raise prices, but, by economical working, to reduce them. The lower the prices, the better the sale.

The report was adopted.

The Chairman then moved: "That a final dividend of 3½ p.ct., making 6 p.ct. in all, for the year ended Dec. 31, be paid on the ordinary shares, free of tax."

Mr. G. G. Brodie seconded the resolution, which was passed.

Mr. William Mathieson and Mr. James W. Wilson were elected Directors of the Company, on the motion of the Chairman, seconded by Mr. Charles Clare and Mr. James W. Slack.

At an extraordinary general meeting the Articles of Association were amended to meet the new conditions from the fusion of different companies in Radiation, Ltd.

Water-Gas Plant for Bo'ness.—For some time the Bo'ness Gas Light Company, Ltd., have been considering the installation of a water-gas plant; and recently the Directors paid visits to several works, in order to view the various types of plants in operation. As a result, they have decided to place a contract with Messrs. Humphreys and Glasgow for a plant of a capacity of 140,000 c.ft. per 24 hours, with all the latest improvements.

Radcliffe Joint Gas Board Bill.—Prestwich was one of the authorities to drop out of the scheme for the transfer of the Radcliffe gas undertaking to a Joint Gas Board; and at a meeting of the District Council last Wednesday, it was moved: "That the Clerk be instructed to take the necessary steps in order to present a petition against the Radcliffe and District Joint Gas Board Bill, on the ground that the transfer of the Radcliffe and Pilkington Gas Company's undertaking to the proposed Joint Board will be detrimental to the interests of gas consumers in the Prestwich district, and to co-operate with any other local authority." The motion was defeated by a large majority.

Improved Public Lighting in New Edinburgh Areas.—A Sub-Committee of the Edinburgh Cleaning and Lighting Committee considered on the 7th inst. the question of bringing-up the standard of lighting in the areas recently annexed to that existing in Edinburgh generally. They recommended: (1) That incandescent gas should be introduced into the common stairs in Leith and the suburban areas (at present flat-flame burners are used, while in some districts there is no stair-lighting at all); (2) that, with respect to street lighting, the same standard, as regards both gas and electricity, should prevail in Leith as in Edinburgh; (3) that the Craigmillar, Gilmerton, and Liberton districts should be provided with clock-controlled lamps; and (4) that the pressure-wave system of automatically lighting and extinguishing public lamps, which has been in successful operation in several districts in Edinburgh, should be extended to the village of Corstorphine. It is suggested that payment of the cost of supplying incandescent burners to the common stairs in Leith, &c. (which will amount to about £6400), should be spread over three years, as was done when incandescent lighting was originally introduced into the common stairs of Edinburgh.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade by gas undertakings for Orders under the Gas Regulation Act.

Canterbury Gas and Water Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 4d. per 1000 c.ft. supplied within a radius of 2640 yards from the Guildhall, in the City of Canterbury, and 4s. per 1000 c.ft. supplied beyond such radius; and the prices they have asked the Board of Trade to substitute for these are 1s. 8d. and 1s. 9d. per therm respectively.

Exeter Gas Light and Coke Company.

The standard price authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the maximum price now authorized in respect of the supply of gas for public lamps is 3s. per 1000 c.ft. The prices the Company have asked the Board of Trade to substitute are 1s. 5·2d. and 1s. 0·9d. respectively per therm.

Grays and Tilbury Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 4s. 4d. per 1000 c.ft. in respect of places situate within the urban district of Grays Thurrock, or within a circle having for its centre the gas-works by the Grays and Tilbury Gas Act, 1907, vested in or authorized to be made, continued, or maintained by the undertakers, and for its radius 1 mile; and 4s. 10d. per 1000 c.ft. in respect of all other portions of the limits of supply. The prices which the undertakers have asked the Board of Trade to substitute for these prices are 2s. 1d. per therm in respect of the places situated within the urban district of Grays Thurrock or within the above-mentioned circle, and 2s. 2·6d. per therm in respect of all other portions of the limits of supply.

Hastings and St. Leonards Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 10½d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 7·6d. per therm.

Keswick Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 4s. 3d. per 1000 c.ft. within the area of the urban district of Keswick, and 6s. per 1000 c.ft. beyond that district; and the prices which they have asked the Board of Trade to substitute for these are 1s. 8d. per therm within the area of the urban district of Keswick and 2s. 4d. per therm beyond that district.

Riddings District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 8d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm.

Rushden and Higham Ferrers District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft. within an area including the urban district of Rushden and the borough of Higham Ferrers, and 4s. per 1000 c.ft. beyond the said area; and the prices which they have asked the Board of Trade to substitute for these are 1s. 3d. per therm within the area including the urban district of Rushden and the borough of Higham Ferrers, and 1s. 5d. per therm beyond.

Yeadon and Guiseley Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 4d. per therm.

GAS AND ELECTRICITY.

A Call for Co-Operation.

There was a long debate—which was only brought to a close from considerations of time—at St. Bride's Institute, E.C., last Wednesday evening, on the subject of "Gas *v.* Electricity for Lighting, Heating, Cooking, and Power." The discussion was initiated by the National Association of Supervising Electricians, from whose side, of course, came the majority of the speakers. The case for gas, however, was quite safe in the hands of Mr. F. W. Goodenough, the Executive Chairman, and Mr. W. M. Mason, the Manager, of the British Commercial Gas Association. The chair was occupied by Mr. J. S. HIGHFIELD, consulting electrical engineer, who called upon Mr. Goodenough to open the debate.

Mr. GOODENOUGH said he felt really that he ought to apologize for being there that evening as the representative of an industry which, from what was said years ago, ought to have been dead long since. He had been living in this question of gas *v.* electricity for the past eighteen years, during which he had been in charge of the sales side of the Gas Light and Coke Company and connected with the British Commercial Gas Association; and often during this period he had looked at a cartoon (between thirty and forty years old) in his office, which showed electricity snuffing-out gas. The fact of the matter was, however, that there was plenty of room for both industries in the service of civilization. During the eighteen years he had had charge of his department, the increases in gas consumption had been as follows: In the six years ended 1908, 1741 million c.ft.; in the six years ended 1914, 2813 million c.ft. (or 4554 million c.ft. in the twelve years); and in the six years ended 1920, 5178 million c.ft., or considerably more than in the previous twelve years. Altogether this represented an increase of 44 p.ct. on a business which was a hundred years old. This was not exactly a sign of stagnation. Electricity had, of course, made very great strides during the same period, particularly in the direction of lighting and power. Each commodity had special fields in which it was practically beyond any competition; and the debatable ground was really relatively small. He would therefore say to his friends the electricians, "Why not face facts all round, and concentrate on each side on really profitable business, rather than waste a good deal of both time and energy in trying to hurt your competitor without profit to yourselves?" Gaseous energy and electrical energy were used for three purposes—as a source of illuminating power, mechanical energy, and heat. The possibilities of developing illuminating power from either electrical or gaseous energy were, as far as he knew, quite unlimited. Of course, they were not unlimited in fact; but it was not known what the physical limit was. Twenty years ago they were practically confined, except for the arc lamp, to the carbon lamp requiring 4 watts or more per candle power. Since then the electricians had come down considerably in their consumption; and in the same way the efficiency of gas had gone up from 2 to 2½ candles per cubic foot with the old flat-flame burner, to anything from 50 to 60 candle power with gas under high pressure. What possibilities still remained, they could not tell. When, however, one came to mechanical energy and heat, the limitations were known exactly. There had in the last twenty years been an enormous advance in the production of power from both electrical and gaseous energy; but gas had much more possibility of further improvement in this direction than electricity, because in the gas-engine they did not now get more than about 25 p.ct., or at best 30 p.ct. of power in relation to the heat units employed in the engine. When it came to using either form of energy for heat, both knew precisely how much could be got.

In this connection, Mr. Goodenough proceeded to explain the "therm" basis of charge, and answered his own question, "How will a therm compare with a Board of Trade unit of electricity?" He said 100,000 B.Th.U. (a therm) was the heat equivalent of 29 units of electricity—or rather less than 30 units. The equivalent when one took actual efficiency would vary according to the purpose for which it was used. With gas, they would get from 4000 to 10,000 candle-power-hours, according to whether low or high pressure was employed. He calculated that the electricians would, according to the varying efficiencies of the lamps they used, need some 6 units; but putting it on the conservative side, he said a therm would equal in lighting power, light for light, hour by hour, 5 units of electricity. There were, however, several other considerations that came into the account when people were paying for their light. As far as gas was concerned, renewals were cheaper; but electricity could claim the economy resulting from ease in switching off and on—without which electricity would not be able to compete at all economically with gas. He should say that electricity was always more expensive than gas. There were other reasons which led to electricity being invariably adopted in certain instances; and it had a very big field for lighting. But there were also conditions under which gas was adopted without question as the source of light. Perhaps some of those present thought electricity was the only light. Some of the housing authorities, where they owned the electrical undertaking, had also got this idea in their minds, and were incurring a waste of money in putting down electric cables for the supply of light for working-class tenants, which would be found a very unremunerative proposition. There was a striking case during the war in which a big estate in the neighbourhood of London was laid out for munition workers. There were 1300 houses; and the estate was cabled for electricity and piped for gas, the tenants being given the option of using the one or the other. There were eleven who selected electricity, and 1289 who chose gas; and of those who preferred electricity, five had since changed to gas—leaving six users of electricity. Now, the reason for this was undoubtedly the fact that the working woman asked to have in her house for lighting an illuminant that would help to take the chill off the room in the hours of darkness. There were very few hours during the warm months of the year in which artificial lighting was needed in the house. This, he thought, was the ground on which the great mass of working-class women preferred gas for lighting. When they came to power, the therm would give them from 10 to 12 B.H.P., according to the size of the engine and load. Of course, if the load was very bad, it would go below the 10 B.H.P.; but taking the mean as 11 B.H.P., this would represent somewhere about 10 units of electricity. So a therm was equal to 10 units; and the comparison could be made from this. But there, again, there were cases where electrical power had such other incidental advantages that it was adopted in preference to gas. His Company on the works used electricity generated by gas-engines, because the electric motor was so particularly suited to cases where the units of power were required to be divided-up and used intermittently. On the other hand, where there was a considerable and regular load, gas had proved over and over again the cheaper source of power when the two had been tried one after the other.

Next Mr. Goodenough took up the question of the use of gaseous and electrical energy for the production of heat. Frankly, he said, the vast field of heating, either industrially or for domestic purposes, for warming or for cooking, remained with gas. Mr. Gillott, in some notes which he had prepared for the meeting, still put forward claims which it was rather surprising to see in regard to the use of electricity for cooking. Among other things, he made the old claim about electricity saving the meat. It was an astonishing thing, if this were true, that the Government did not insist upon the adoption of electric cooking throughout the country, at the time when food was so scarce. He seriously suggested to his friends that they would benefit themselves much more if they stuck to claims for electricity which could be well substantiated—and there were plenty of them—and that they should not go out and try to capture unsuitable business, simply because the gas companies had got this business, and they did not like the gas companies, and would be glad to take the business from them. There was a good deal of this in the pushing of electricity for heating and cooking; and it seemed to him to be the height of folly. He thought he had said quite enough to show them what his grounds were for claiming that there was a big field for electricity, a big field for gas, and a comparatively narrow field in which the two contended for supremacy. With regard to electricity for lighting, he gave it first place in many cases. There were often instances in which, if he were advising the consumer, he should recommend electricity; while in other circumstances he should advise gas. It was a pity that the two

industries should ever waste their time fighting for business in a field that did not really belong to them. He put forward this suggestion for the consideration of his friends who shared with the gas industry the privilege of serving the community in many useful ways. He hoped all he had said would be taken in the spirit in which it was meant—one of perfect friendliness and a desire to get at the truth, in order that they might both be guided on the lines of common sense in carrying out their services to the community.

The Claims of Electricity.

Mr. W. A. Gillott, in putting forward the case for electricity, said the first thing he would like to know was, Where was the dividing-line in the fields of the two industries? In connection with lighting, all electricians knew they could go and secure business without difficulty. He would suggest that the large percentage of gas users on the estate to which Mr. Goodenough had referred was probably owing, first, to the existence of the slot-meter, and, secondly, to the fact that they desired something besides lighting. They must all admit that there was room for both gas and electricity. The sale of gas was increasing, and so was that of electricity; they were bound to get an increase on both sides, no matter what the conditions were. As to electricity for power, surely the fact that it was used in gas-works was the finest testimony that any electrical engineer could wish for. The electric cooker five years ago—and this was taking them back only a very short distance—was nothing like the cooker it was to-day; and he ventured to suggest that in this connection their friends the gas engineers were basing the majority of their statements on figures that were more or less out of date. Many of them knew that he had looked after the cooker business in Newcastle. He started developing electric cookers there in 1911, when he did not think that there were more than fifty meals a week cooked by electricity; whereas before 1914 there were 250,000 meals cooked daily by this means. This showed that there was something in cooking by electricity. The man who cleaned one's boots outside the station at Newcastle cooked by electricity; and the miners cooked their breakfasts by electricity before going to work. As to the question of comparative costs, frankly he did not think the cost of cooking entered into the matter so much as some people imagined; but, if so, he would ask them to take into consideration the all-in cost. In certain respects, went on Mr. Gillott, with electrical heating, it was known that they could get practically 100 p.ct. efficiency. To supply a man with gas giving so many British thermal units, and then to give him apparatus which wasted 60 to 70 p.ct. of the units, was disastrous. For domestic water heating electricity was expensive; but so was gas. Comparing two houses, he said that in his own case, using coal and electricity in a ten-roomed house, with six persons and one maid, the total cost was £32 a year. In a neighbouring ten-roomed house, using coal and gas for lighting, cooking, and two fires, with eight in family and two servants, the total cost was £60 a year; and the house was always dirty, while his own was always clean. He then gave some figures relating to electric cooking in restaurants, and touched upon the question of National Kitchens, with which he had had something to do. He said the Coal Controller's Department had stated that every National Kitchen must prepare 1000 portions of food with the equivalent of 3 cwt. of coal, whether they used gas, steam, or electricity. There was a record taken of fifty National Kitchens in the Metropolitan area. There were, he thought, thirty-four gas-kitchens, twelve combined steam and gas, and the balance electricity. The average equivalent coal consumption was: Gas-kitchens, 3 cwt. 64 lbs. per 1000 portions; steam and gas, 2 cwt. 88 lbs.; and electricity, 2 cwt. 28 lbs.

Mr. J. W. Beauchamp said they had had several of these discussions in times past; and they had the advantage of bringing them in touch with gas engineers. He hoped they showed how much electricians appreciated the gas men and the service they gave the public, as well as their propaganda work and their excellent organization. He thought the success of gas was due to two things. First, the continual urge and drive of electrical competition; and, secondly, the very remarkable manner in which most gas undertakings advertised the service they gave, and in which they looked after the consumer when they had secured him—a most important point. It was not possible to find more courteous and competent men than those who were sent round to even the smallest consumers by the big gas undertakings. Where were the gas people taking them to in these little conferences and discussions? He assumed there was something behind it; and his opinion was that they were trying to lead the electricians to a position where they might agree to a delimitation of the fields of activity for electricity and gas. If the future should—and he thought that the future might—hold for them some co-operation between gas and electricity on the generating side, he did not want to see it hold any co-operation on the distribution side. In other words, he wanted the public to decide. "If," he said to his electrical friends, "you push the advantages of your wares with anything like the pertinacity that the gas people push theirs, there will be much more business for all of us."

Mr. Selley, referring to what Mr. Goodenough had said about the increase in gas during the past eighteen years, remarked that in the same time the electrical business had increased 178 p.ct. Many more householders would take-up electric heating were it not for the initial cost of installation. In spite of this, hundreds of instances could be cited in one district alone in which gas had been discarded for electricity. Fortunately for the gas interests, they had to deal with a competitor who was not nearly so alive commercially as themselves.

Mrs. Cross then quoted some results of cooking by electricity, which she found less tiring and cleaner to use than gas. The losses in weight of the hundred joints cooked in this way were added together, and found to be only 8 p.ct.

Mr. Nobbs gave some figures drawn from a paper read before the Institution of Heating and Ventilating Engineers, with regard to heating only. These went to show that with gas at 5s. per 1000 c.ft., and a calorific value of 450 B.Th.U., and fires of 60 p.ct. efficiency, the cost per 100,000 B.Th.U. (useful) would be 2s. With electricity at 1½d. per unit, and an apparatus efficiency of 100 p.ct., the cost came to 3s. 6d. for current. This took into account solely the efficiency of the apparatus; but there were, of course, many other considerations that had a commercial value. There was the cost of installation, depreciation, interest, maintenance, attendance, and (in the case of gas) building flues. Taking into consideration all these factors, but no others that might be included, the result was in favour of electricity by 33 p.ct.

Not Opposing Camps.

Mr. W. M. Mason remarked that, if they looked at the matter in a proper way, this was a case of allies on one field. His first experience in the gas industry some fifteen or sixteen years ago was with a man who had charge of an important electricity department in addition to the gas undertaking. In the early days of electricity, the business was run by gas engineers, and there was still quite a big business conducted by gas men. He held that this was how things should be, and that it was a national disaster for them to be in opposing camps. They should have but one idea—the public utility service. If he could go home with all those present, he wondered how many gas-cookers he would find. He was surprised to hear of the shoeblack cooking by electricity, though it was easier to understand the miner doing it. In many ways electricity was a "top-hole" thing; and the gas man was not such a fool as to say that electricity had not a wonderful future before it. So had gas. But electricity could not entirely fill the bill, any more than gas could do it. Speaking for the British Commercial Gas Association, he would say that they, as a plank in their platform of policy, did not say one word against electricity. He challenged them to show him one advertisement during the last ten years in any public announcement of the Association in which there had been any direct criticism of electricity—excepting when the electricians deliberately went out of their way to say what was not true. Then, of course, the Association went in to tell the truth. [Laughter.] But in their ordinary policy they went on the line that there was room for both.

Mr. Carter referred to the constant value of the unit of electricity. The electrical engineer or the power user could always be certain that his apparatus would give the same results, provided the voltage remained constant. The electrical engineer had had coal troubles; but he had solved them for himself. The gas company passed their coal troubles on to the consumer.

Mr. C. Nobbs argued that the whole question remained with the public. They wanted useful efficiency. Wherever it might be desired to put the dividing line, it must be broken down.

Mr. Bird said the cost of appliances told heavily against electricity companies. He cited a case at Norbury in which a plebiscite was taken. Only women were asked to vote; and the majority were in favour of electricity. With cheaper appliances there would be much greater use of electricity than was possible for the working classes at the present time. If Housing Committees were prepared to bear the initial cost, and not expect the occupiers to pay the charges over a period of years, electricity would be more widely adopted.

Mr. Goodenough, in a brief reply to the points raised, said the improvement in the electric cooker was a tale he had heard for ever so many years. There was also room for progress in the design of gas apparatus. This was being made, and efficiency was being steadily improved. In his Company's district they sometimes found electric cookers fitted with gas hot-plates, because the users had found electricity for water heating too costly. Where electricity had met with success for cooking, and been retained, it was where the previous experience had been with coal. He certainly had in his mind no cut-and-dried scheme of delimitation of spheres of action. When one speaker referred to electricity's 178 p.ct. increase, he should have remembered that gas had been in business a hundred years before. To add in eighteen years 44 p.ct. to a business that had been going for a hundred years, took some doing. In the last few years people had put in electric radiators or oil-stoves, or whatever they could get; and they had been begging for gas apparatus which the companies could not supply. If gas companies could have tackled the business offered them, he did not think the electricians would have had such an increase. On another point, he said the deaths from gas poisoning had been one per annum of two million persons using gas. If electricity could show a better mortality record than this, he would be surprised. As to the shrinkage of meat, it had often been pointed out that the moisture in question did not add to the nutriment of meat. If it was desired to preserve this moisture in the meat, and so save the weight, all that was necessary was to enclose the meat in a tin box and place the box inside a gas-oven. In this way precisely the same result could be obtained at considerably less expenditure than would be involved in having an electric cooker.

The Chairman thanked Mr. Goodenough and Mr. Mason for coming along and presenting so interesting and excellent a case.

York Housing Scheme and Gas.—At a meeting of the York Housing Committee, the City Engineer submitted a letter from the Secretary of the York Gas Company in regard to gas services to the Tang Hall Estate houses, alleging that the Committee had thrust upon the tenants a supply of electricity, the convenience and value of which to the tenants was very small as compared with the value of gas in the home. The Secretary further stated that if the attitude adopted by the Committee were caused by an opinion that the Company could afford to run the gas-mains to the estate, such opinion was quite erroneous, and, so far as could now be seen, gas could never be carried to the estate as a commercial proposition. No action was taken on the letter.

Automatic Street Lighting Saves £8 a Week.—The number of public street lamps lighted this season in the Urban District of Blyth (Northumberland), Mr. L. Leeper, the Town Surveyor, states, is 527. Of these, 270 are controlled by Messrs. Alder and Mackay's two-wave pressure apparatus; the remaining 257 being lighted by hand. The controlled lamps are looked after by two men; and the hand-lighted lamps by four men. Thus the controlled method of lighting saves the ratepayers over £8 a week in wages alone—a saving which can be materially increased by an extension of the controlled lamps. The old Welsbach lamps of 300-candle power, which were fixed in the main street, have been removed, and controlled lamps, with double burners, fixed in their places. This improvement has greatly increased the light of each lamp and reduced the gas bill by two-and-a-half times.

GAS COAL SHIPMENT CONTRACT.

In the King's Bench Division of the High Court of Justice on Friday last, Mr. Justice Roche heard an action brought by the Monte Video Gas Company, Ltd., against the Clan Line of Steamers, Ltd.

Plaintiffs claimed damages for the non-delivery of 1471 tons of Scotch screened gas coal shipped in the "Clan MacBeolan," under a charter-party dated April 22, 1918.

Mr. WRIGHT, K.C., for the plaintiffs, said the action was mainly concerned with the true measure of damages plaintiffs were entitled to in the events which had happened. The plaintiff Company carried on their business at Monte Video, and required from time to time supplies of gas coal, of which they consumed 1500 tons monthly. They shipped with the Clan Line a quantity of this coal (something over 1400 tons) in April, 1918, on this vessel. The times were difficult, and the plaintiffs were urgently in need of the coal. The coal was shipped; and the vessel in due course arrived at her destination. By an unfortunate accident, however, there was delivered to the plaintiff Company, not their 1400 tons of gas coal, but another lot of 1000 tons of steam coal, which was shipped on board this vessel for another consignee. Plaintiffs, not knowing of the mistake, accepted the steam coal in the belief that it was a short delivery of their gas coal. Later on, the mistake was found out; and the question arose as to the damages the plaintiffs were entitled to. Subsequently, after negotiations between the parties and no settlement being arrived at, the present action was brought.

Mr. *W. Doig Gibb* said that he was acquainted with the kind of gas coal that should have been delivered to the plaintiffs in this case, and also with the navigation coal that was actually delivered. There was nothing in the appearance of the Scotch steam coal which would distinguish it from the Scotch screened gas coal without making tests. He was familiar with the distillation of all kinds of coal; and the figures put forward by plaintiffs as to damage he considered were quite reasonable. He was of the opinion they could justly have made a stronger claim.

In cross-examination, witness said the appearance of the two coals was practically the same. In Wales it was possible to distinguish between gas and steam coal; but with Scotch coal which came from Lanarkshire and Stirlingshire, one could not distinguish between them, not even when one's suspicions were aroused—they must be tested.

His LORDSHIP: The loss of coke was said to have been very large in the case of steam coal. What happens to the residues in the case of steam coal, as compared with gas coal?

Witness: They are very low in proportion. If you carbonize a very hard steam coal—not Scotch—what you would get out of your retort is absolutely dust.

His LORDSHIP: It is practically all consumed.

Witness replied in the affirmative. He added that during the war steam coal was supplied to different gas-works. When subsequently investigation was made as to the short supply of gas, it was always found that the steam coal was the cause of it. No compensation could be obtained from the coal in other directions.

Defendants admitted the wrong coal was delivered; but contended that the damages, as claimed by plaintiffs, were remote. They further expressed their willingness to make some allowance, and counter-claimed for freight alleged to be due by the plaintiffs.

Evidence was called for the defence to show the great difficulties that were experienced at the time in question in getting shipments of coal away at all.

Judgment was reserved.

GAS OR ELECTRICITY FOR HOUSING SCHEMES.

At a Meeting of the Worcester City Council there was brought forward the question of the liability for the cost of water, gas, and electricity mains for 150 houses about which there was some difficulty with regard to charging the cost against the housing account.

Alderman LEICESTER said the financial adviser of the Ministry of Health had stated that he would be very much surprised if the Gas Company were not forced by Act of Parliament to put in mains at their own expense. The gas might be chargeable to the housing scheme; but on no account, he said, would the gas and electricity mains be allowed to be charged against the account. He therefore moved that the provision of electric mains on the housing sites, in addition to gas-mains, should be abandoned as not necessary. In reply to a question as to whether both kinds of mains would be suspended until a settlement of the point, he declared that the gas was going on at all costs.

Mr. HILL said he felt that an important principle was involved, as the Electricity Department had received instructions from the Housing Committee to lay the cables without any qualification, and not subject to any departmental approval. They had already incurred an expense of £4000, and it was important that a definite decision should be given at once.

Mr. FAIRBAIRN said it would be a reflection on the electricity undertaking if they did not light the houses by electricity. The provision of electric light fittings was included in the building contracts; and they would have to substitute gas-fittings, which would be no cheaper. He moved an amendment that the houses be lit by electricity.

There was some further discussion, in which several members joined, and during which the relative claims of both gas and electricity were urged, and also the question of whether the expense of putting in the mains would be charged to the housing account or fall upon the ratepayers.

Eventually the amendment that the houses be lighted by electricity was carried.

The issue of £72,300 of 8 p.ct. redeemable debenture stock in the Rochester, Chatham, and Gillingham Gas Company, which was recently offered by Messrs. A. & W. Richards, was over-subscribed.

TRADE NOTES.

[For "Journal" Advertisers.]

Economizing in Fuel Combustion.

The following recent fitments of "Meldrum" furnaces for economizing in fuel combustion may be notified: Aberystwith, Hamilton (N.B.), Swindon, and Tynemouth Gas-Works—repeat and second repeat orders for furnaces to Lancashire boilers. Yorkshire Electric Power Company, Barugh Power Station, Barnsley—furnaces to large water-tube boilers. Messrs. J. Critchley & Sons, Batley Collieries, and the Oughterside Colliery Company, Bullgill, Cumberland—repeat and second repeat orders for furnaces to Lancashire boilers. Gwaun-cae-Gurwen Anthracite Collieries, Swansea—second repeat order for furnaces to large water-tube boiler. Springfield Mental Hospital, Tooting—repeat order for furnaces to Lancashire boiler. Messrs. Meldrums, Ltd., are now represented by Mr. H. Astbury, of Empire House, Birmingham, for Birmingham district and the Black Country.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 14.

The tar products market is very disorganized at present, and little business is reported in London. Creosote and other products are weak, with prices nominal.

Tar Products in the Provinces.

March 14.

The position with regard to pitch is much about the same, although some business has been reported for the forward position at very low figures. There is nothing further to report regarding bye-products.

The average values for gas-works products during the week were: Benzole 90 p.ct. North, 2s. 10d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 1s. to 1s. 0½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 9d. to 3s. Creosote, in bulk, North, liquid, 9½d. to 9¾d.; salty, 8¾d. to 9d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 8d. to 1s. 10d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 10d. to 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is no sign of any revival of interest in tar products so far as one can see. The market remains as dull and depressed as ever, in spite of the fact that the output of most of the products has been reduced in a very extensive manner. Many of the coke-ovens are closed down, and there does not seem to be any intention of restarting them, as it is impossible to make coke at prices at which it must be sold. There is no business to test quotations, which are all more or less nominal. There is talk of £5 per ton having been paid for pitch. Probably the briquette trade can pay this price; but there is not much demand for patent fuel, particularly on the Continent, where German coals under the Peace Treaty are somewhat glutting the market. Solvent naphtha is a quiet market at slight reduction on old rates; but there is very little business about. A similar sort of position is to be noted in the naphthalenes. Lower prices have been mentioned for creosote. There are, however, rumours that an improvement is on the way; but they are only rumours. Carbolic acid is not being extracted, as it does not pay to do so. A further fall in crystals 40 p.ct. is to be reported. From the foregoing it would seem that things cannot get much worse, and that we ought to see some early recovery in the trade. Intermediate products, strangely enough, maintain their position fairly well.

The range of quotations is as follows:

Benzole: 90% London 3s., North 2s. 6d. to 2s. 8d.; crude 60-65%, 1s. 9d. to 2s.; pure, 3s. per gallon naked.

Crude Tar: London, 95s. to 105s.; Midlands, 97s. 6d. to 102s. 6d.; North, 95s. to 102s. 6d. per ton *ex* works. Refined tar, 85s. per barrel (free) on rail.

Pitch: London, 105s. to 110s. per ton f.o.b.; East Coast, 105s. to 110s. per ton f.o.b.; West Coast, 102s. 6d. to 110s. f.a.s., with Manchester 110s. per ton, and Glasgow 115s. per ton; South Wales, 110s. per ton.

Solvent Naphtha: 90-160, 2s. 8d. per gallon.

Crude Naphtha: Naked, 10d. to 11d.; North, 10d. per gallon.

Heavy Naphtha: 2s. 8d. per gallon.

Naphthalene: Refined flake, £28 to £30 per ton nominal; inferior, £18; crude, £7 to £14 per ton, according to quality.

Toluol: Naked, 3s. per gallon nominal; North, 3s.; pure, 3s. 6d.

Creosote: 10d. to 11d. per gallon; heavy oil, 8½d. per gallon in bulk.

Anthracene: 40-45%, 1s. 1d. to 1s. 3d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Pyridine: 15s. per gallon.

Aniline Oil: 1s. 6d. per lb., drums extra.

Aniline Salts: 1s. 8d. per lb.

Cresylic Acid: Crude, 2s. 3d.; dark 95-97%, 2s. 6d. to 3s.; pale 97-99%, 3s. to 3s. 6d., per gallon, drums free.

Carbolic Acid: Crude 60%, 1s. 7d. per gallon; crystals 40%, 6½d. per lb. nominal.

Salicylic Acid: Technical, 1s. 6d.; B.P., 2s. per lb.

Xylol: Pure, 3s. 6d. to 4s.; commercial, 3s. to 3s. 6d. per gallon.

Resorcin: 7s. 6d. to 8s. 6d. per lb.; pure, 10s. per lb.
Alizarine 20%: 2s. per lb.
B. Naphthol: 3s. per lb.

Sulphate of Ammonia.

There is a better demand for this material; farmers being now more inclined to purchase their requirements for the season. The price for delivery during March and until the end of May is now £24 11s. per ton delivered in 4-ton lots to buyers' stations. In many quarters it is anticipated that a further reduction will take place in quotations after May; there being one or two nitrogenous fertilizers which, it is thought, will then compare favourably as regards prices.

In America, there does not seem to have been any change of price on the Pacific Coast, which is one of the principal selling centres for this material, and resale lots are not much in evidence. It is reported there, however, that Japanese stocks are now coming to the Atlantic seaboard by way of the Suez Canal.

Gas-Works Loan for Omagh.—At a recent inquiry by Mr. A. D. Price, Inspector for the Local Government Board for Ireland, into a proposal of the Omagh (co. Tyrone) Urban Council to obtain a loan of £3000 for the purpose of providing working capital for the gas undertaking, Mr. W. J. Corker (the Town Clerk) stated that the town's borrowing powers stood at £25,684 gross; outstanding loans amounted to £43,233; and loans on the gas-works were £35,000, repayable by a sinking fund, of which there was a balance at present of £9104. Mr. J. P. Jamieson (Accountant) explained that the application sought to provide capital for the purchase of coal and salaries. The Council's contribution to the gas-works last year was £5089, which included the cost of public lighting. The gas made was at the rate of 12,129 c.ft. per ton of coal carbonized. Mr. P. J. O'Callaghan (Manager) said the sale per ton had increased from 9214 to 10,402 c.ft.

Gas Consumption at Dover.—Though there has been a falling-off in the consumption of gas, owing to the high price and the competition of the electricity supply undertaking, the Directors of the Dover Gas Company were pleased to be able to submit, at last week's meeting, accounts showing a net profit on the year's working of £3951. This was partly attributable to the satisfactory returns from the sale of the residuals and the lower freights which the Directors succeeded in obtaining for the transport of coal from the North. They recommended a dividend on the stocks and shares for the past year at the rate of 5 p.ct., less income-tax. During the current year the Company will apply to the Board of Trade for an Order providing for the sale of gas on a basis of heat units instead of by volume, as required by the Gas Regulation Act. Arrangements have been made for the erection, by an independent undertaking, of a plant for the production of smokeless fuel at the Buckland works, on terms which it is believed will prove beneficial to the Dover Gas Company.

Eastbourne Gas Company.

The half-yearly meeting of the Company was held on the 7th inst., when Mr. Caleb Diplock presided. The Directors' report showed that a profit of £5352 had been made; and there was a balance of £7190 at the credit of the profit and loss account, after paying the half-yearly dividend in August last and other charges. The Directors recommended the payment of the following dividends for the past half year: At the rate of 3¾ p.ct. per annum on the "A" stock, £2 12s. 6d. p.ct. upon the "B" stock, and 5 p.ct. upon the preference stock. These dividends would absorb the sum of £3896; and, after other payments, there would be a balance of £3294 to carry forward. The Chairman said the Directors were compelled to ask their acceptance of the most miserable dividend they had ever had to offer them. He was sorry for the stockholders; but he hoped this would be the last time they would have to give them such a dividend. During the war, the Government had asked them to furnish constituents for their explosives, and had expressed their appreciation of what they had done—but only in thanks; and the consumers had had to suffer by poorer gas. The Directors thanked the consumers for the forbearance they had shown in difficult times. The sale of gas had increased by 5¾ p.ct. over the previous year; and this increase constituted a record for a half year. The report was adopted; and a resolution was carried showing the appreciation of the stockholders of the efforts of the Directors, the staff, and the workmen, in carrying on the business of the Company in circumstances of so much strain and anxiety. Mr. J. S. Garrard (the Secretary), responding on behalf of the office staff, said that it had been a remarkable half year—a record in every way. They had sold more gas for the December half year than ever before; coal had cost more than ever before; and the dividend was the lowest. After all the gas companies had done during the terrible years of the war, he thought they deserved better treatment than they had received at the hands of the Government.

Rates and Gas-Works Profits.—The Ilkeston Corporation have increased the price of gas 10d. per 1000 c.ft.; but it was admitted that this would not be sufficient to cover the deficiency, unless there was a substantial diminution in outlay, especially upon carbonizing materials. Alderman Shaw, moving the adoption of the municipal budget, pointed out that, when matters were in a prosperous condition, the Corporation had not hesitated to draw upon the profits of the gas undertaking for the relief of the rates; and he suggested that, now the position was not so gratifying in regard to the gas concern (which he described as being in a bad way), they might reasonably consider the propriety of paying back some of the money. Unless this were done, there was no alternative to raising the price charged for gas, against which much objection was being raised locally. The present position was entirely owing to increased prices, coupled with the poor quality of coal with which they had been supplied and the smaller profits on residuals.

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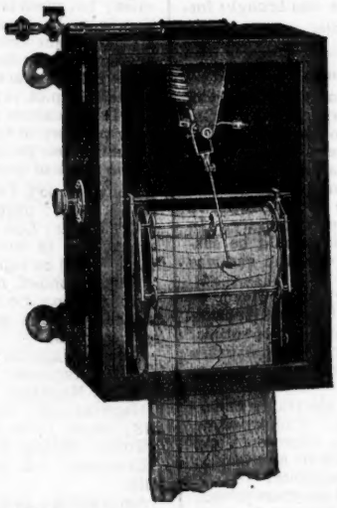

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County Council Sued by Gas Company.

At Nuneaton County Court on Friday last, his Honour Judge Snagge gave judgment (in a case adjourned from the last Court) for £45 against the Warwickshire County Council, who were sued by the Nuneaton Gas Company for damages caused by the defendants' lorry-driver breaking a weighing machine on their premises. Defendants claimed that there was contributory negligence on the part of the plaintiffs, in not warning their driver. His Honour, however, held that this was not the case, and that reasonable care had not been taken by defendants' driver.

Darlington and the Residuals Slump.

It has been decided by Darlington Town Council that the charges for gas next quarter shall be dearer by 6d. per 1000 c.ft. for all purposes. The increased price is from 2s. 9d. to 3s. 3d. for ordinary consumers, and from 3s. 7d. to 4s. 1d. where slot-meters are used. Mr. Dixon (the Chairman of the Committee) said they had waited until the last minute, in order to get the actual facts affecting the increase. Mr. Hinde asked the cause of the rise, and added that it seemed unfortunate for consumers that they should no sooner get accustomed to the idea of a reduction than they were faced with another increase. Mr. Dixon stated that when a 4d. discount was conceded, the most far-seeing men did not anticipate such a collapse as there had been in the market for residuals. The estimated loss by reduction in the sale of coke was £5200. Moreover, breeze had dropped from 60s. to 8s. a ton, and was now practically unsaleable; while tar, which formerly fetched £6 12s., was now worth only £5. He hoped the 6d. would see them through the year; but if things did not go in their favour, they might have to put the price up for the second six months. Alderman Sir Charles Starmer stated that there was a leeway of £17,000 to make up. A 6d. increase would mean about £12,000, leaving a deficiency of £5000, if other costs remained as they were. He thought that the Committee should have asked for 8½d., in order to meet the deficiency.

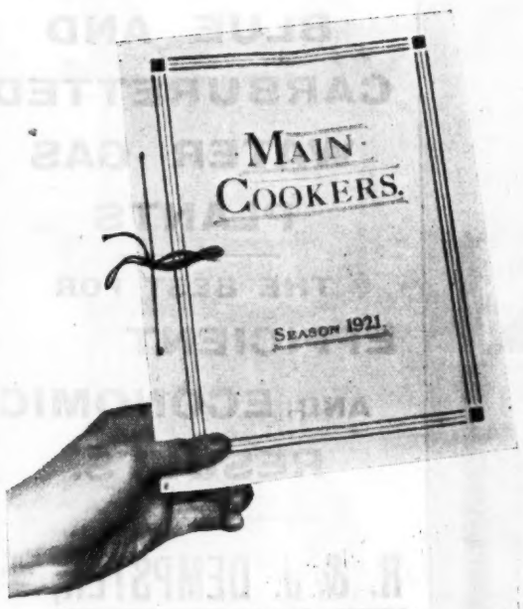
Owing to the large amount of work which falls upon the Stafford Gas and Electricity Committee, the Council have decided that the two departments of gas and electricity shall be controlled by separate Committees.

At Walsall, a young child was found dead in bed, asphyxiated by gas; and from evidence given at the inquest, it transpired that earlier in the day a fitter employed by a private firm had fixed a new burner on a pendant in the room. A foreman from the Gas Department said he had examined the pendant, and found a split 7 in. long. It was very old, and showed signs of corrosion; and the split might have occurred after the fitter had been at work. The fitter, however, admitted that he did not examine the pendant, which looked all right. He ought to have tested it, but did not. The Coroner remarked that great blame attached to the fitter.

Gas Supply Figures from Chicago.

The report of the People's Gas Light and Coke Company of Chicago for the year 1920 shows great improvement upon the depression which marked the war-time period from 1916 onwards. The earnings for last year show a surplus of $380,753, or close upon 1 p.ct. on the stock, after all deductions. In 1919, there was a far smaller surplus; while the working of each of the two preceding years resulted in a deficit. This improved return was apparently due to a higher rate being allowed to be charged for gas, together with a substantially bigger volume of business. The Company sold 29,175 million c.ft. of gas last year, as against 26,529 million c.ft. in 1919. The Company themselves produced about 600 million c.ft. more gas last year, and bought from other undertakings some 2000 million c.ft. more; the total figures being 24,905 million c.ft. produced and 6413 million c.ft. purchased. The impossibility of providing the necessary capital compelled the Directors to abandon the project for the Company to erect a new coal-gas plant; but the negotiations for the installation of a coal-gas plant and of a water-gas plant through a separate corporation, known as the Chicago Bye-Product Coke Company, were successfully carried through, and resulted in a contract with the Koppers Company, of Pittsburgh, to finance and build these plants. It is expected that both plants will be completed and in operation some time during the latter half of the present year. The Directors are hoping to be in a position to pay dividends on the stock of the People's Gas Company by the end of another year. Operating costs are showing a steady decline. Coal and oil have been falling; while labour, by increased efficiency, is very much cheaper. The President told the stockholders at the meeting that "the trouble with gas making at a profit in the City of Chicago is not with the People's Gas Company, but with the treatment received at the hands of the Public Utilities Commission," and the long time that the applications for revision of charges were under review, while the undertaking was being practically starved. All this, however, is now changed.

Distribution of Benzole.—Replying to a statement in an article to the effect that the distribution of benzole was not highly organized, the National Benzole Company, Ltd., who distribute 80 p.ct. of the total quantity produced, have written to the "Yorkshire Post" pointing out that they are in a position to give rapid deliveries to users, but that the small supply of benzole available constitutes the real difficulty. The total consumption of motor spirit in these islands, the Company say, is 250 million gallons; and the quantity of benzole produced is only about 20 million gallons. If the 20 million gallons were distributed between each village throughout the country, users would be in a much worse position, by reason of the very small quantity which would be available, than they are under the present arrangements, which provide for certain regular users receiving an adequate supply. Benzole suppliers possess an adequate stock of tins and drums; and the transport arrangements are sufficient to cope with the requirements of general distribution.



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The Sulphate of Ammonia Position.

Reporting to his Committee on the financial position of the undertaking (which he thinks still gives cause for considerable anxiety), Mr. Percy H. Fletcher, the Engineer of the Evesham Corporation, gives it as his opinion that eventually every undertaking will have to charge for gas by the therm. With regard to the sulphate of ammonia position, he says: During the war and now, the sale of sulphate of ammonia has been under the control of the Sulphate of Ammonia Federation and the Board of Agriculture and Fisheries—the maximum price to be charged and the sale being fixed by agreement between these two bodies. During the war, this article was required for three purposes: Home agriculture, munitions, and export; the home selling price being fixed, with the result that those selling to the other two markets obtained a much higher price. So that home agriculture should not be starved by this, an equalization scheme was brought out whereby those selling for home use benefited by the sales made in the other two directions; the calculations being based on the tonnage produced by the particular works. We have received approximately £100 as our share in the business. Recently, however, the export market had a severe check; and there has practically been no export sale, the result being that it seems highly probable we shall be asked to hand-back the money received, if not more. In any case, it is quite probable that sulphate of ammonia will for a time have to be made at a loss. The matter has arrived at a point which I consider to be highly unsatisfactory. To put it into plain language, it seems to me to resolve itself into this: That we, being sulphate makers, are requested to sell to a local farmer to a price fixed, which is approximately £24 11s. per ton this month, credit ourselves with £10, and be prepared to hand over the balance (£14 11s.), to be divided between those engaged in the export trade. This seems to me a most unjust proceeding; and I cannot think it will be allowed to go on. In any case, it shows the present state to which this market has arrived, and that the manufacture of this article is not likely to be of any real benefit to the department for some time. I think you will agree that the outlook generally is worse rather than better, and that the future financial position will require very careful consideration.

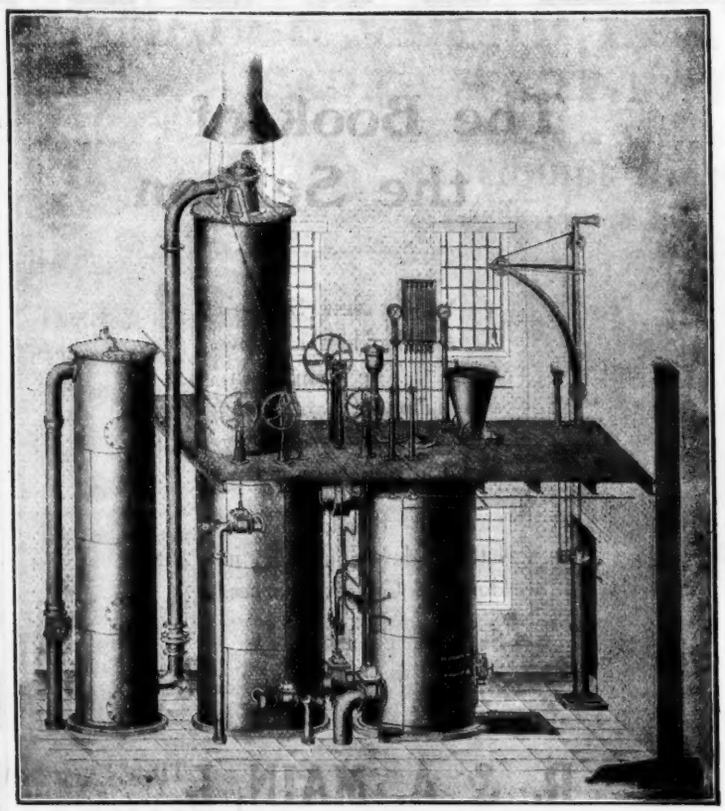
Middlesbrough Gas Price Increased.—Mr. Wesley Brown, in presenting the budget statement at a meeting of the Middlesbrough Town Council on Tuesday of last week, stated that in the gas-works the town had an excellent asset, even with gas at 2s. 4d. per 1000 c.ft. The Corporation Gas Committee have decided to increase the price of gas by 4d. per 1000 c.ft. from the next meter-reading.

Strabane Gas Price.—At a meeting of the Strabane Gas Committee, a letter was read from the Local Government Board for Ireland intimating that they could not see their way to authorize a temporary increase in the price of gas. Instructions were then given to the Town Clerk to have the necessary forms completed for making application to the Board of Trade for permission to increase the charge.

Brighton Gas Company and the Regulation Act.

Following upon a conference between officials of the Brighton and Hove General Gas Company and representatives of certain local authorities, regarding the Company's application to the Board of Trade under the Gas Regulation Act, a letter has been received by the Southwick Urban District Council to confirm an offer made on the part of the Company in view of a possible agreement with the local authorities. If the application of the Company for a standard price of 1s. 6d. per therm were granted by the Board of Trade (in the absence of any opposition from the several local authorities), the Directors would not increase the price of gas—*i.e.*, the price per therm—beyond the present charge, save and except they were compelled to by certain adverse economic circumstances. Moreover, the Directors would not recommend, for a period of at least two years from Jan. 1 last, any higher distribution of dividends on the ordinary stock than the rates paid for the half year July-December, 1914—namely 11½ p.ct. on the original ordinary stock and 8½ p.ct. on the "A" ordinary stock. The Clerk stated that the Shoreham, Southwick, and Steyning East Councils had been associated together in the matter; and they had decided that the Company's offer in no way met the objections of the Council to the proposals. Consequently they recommended that the Company be opposed. If the proposals of the Gas Company went through, it would affect Southwick to the extent of about £2400 a year, and Shoreham to somewhere about £2600 or £2700. As the basis which would be adopted as the result of the inquiry would be that upon which they would have to pay for years and years to come, the matter was of the very greatest importance to the district. The present standard rate was 5s. 6d. per 1000 c.ft., and the proposal of the Gas Company would be equivalent to an increase of about 8d. upon this. The Council approved the decision of the Joint Committee to oppose.

Electricity Rejected for a Housing Scheme.—An application to erect standards in connection with the supply of electricity to the town of Kington was considered by the General Purposes Committee of the Urban Council last week. Inquiry had been made of the Town Clerk of Hereford as to when the Hereford scheme was likely to reach Kington. It was now stated that the proposed maximum price to be charged for electricity for lighting purposes was 11d. a unit; and they were informed that, on this basis, the cost of electricity was little more than half the cost of gas at 8s. 6d. per 1000 c.ft. net. On the other hand, the cost of wiring and fixing the electric light would work out (for twelve houses under the housing scheme) at about £150, as against £80 for making similar provision for gas. Further, they understood that electricity could not at present be supplied at an economical price for heating or power purposes; and, as provision for both services could not be made, the Housing Committtee were of opinion that, in all the circumstances, it would be wiser to carry out the original specification for lighting and heating by gas. This was approved by the Council.



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Whitleyism and Grading in the Gas Industry.

Mr. J. Williams, J.P., lately addressed a meeting of Lancaster gas-workers on the subject of "Whitleyism in the Gas and Electrical Industries"—being a reply to the recent criticism by the Lancaster Town Council, in which labour members participated. Mr. Williams admitted that he was not very appreciative of Whitleyism; but he felt it his duty to accept the principle of the scheme as the alternative to strikes. He happened to be a member of the Committee who dealt with the zoning and grading, which he explained at length. A claim was submitted early in 1920 for an advance of 10s. per week to gas-workers; and 6s. to 10s. was granted. The men who did not get 10s. threatened to strike; and the employers asked for uniform wages in particular areas, which were classified according to industrial or residential character and gas production. In his opinion, a gas-worker ought to have equal pay for equal work, and he advocated one zone; but the employers did not agree. An Arbitrator graded the industry into three zones. Lancaster appealed against being in "B" zone; but the employers placed them there, and they had to stay. So it was lack of knowledge which led labour members of the Town Council to suggest that big trade unions were penalizing Lancaster. As a matter of fact, Lancaster had penalized the gas-workers, not having paid the advance to which they were entitled; and that was the reason they had so much to pay now to bring up the wages to the right standard. They would be in Grade B on April 1. If the Council backed out of the Regional Council, they would have to make their own gas.

Glasgow Street Lighting.—A deputation from the Corporation of the City of Glasgow is at present in London on a visit of inspection in connection with the public lighting. The deputation consists of Bailie James Stewart, the Convener of the Lighting Committee, Bailie John Mitchell, the Deputy-Convener of the Lighting Committee, Mr. Robert Richmond, of the Town Clerk's Department, and Mr. S. B. Langlands, the Public Lighting Inspector of Glasgow. The deputation are being received by the Corporation of the City of London.

Gas Statistics.—In the issue of the "Economist" for the 12th inst., there appears an article analyzing the accounts of a number of London and Provincial gas companies for the past three years; some pre-war figures being included for purposes of comparison. In the course of the article, the author says: It could be wished, for the convenience of those who have to compile statistics and study the financial position of gas concerns, that a more convenient method were employed in showing how profits have been allocated. Some companies, for instance, have five or six different types of stocks, and pay varying dividends on each. Only the rate of dividend is given; and this is often shown without other information as to how the total distributed on all stocks has been arrived at. Though it may be important to know that the "A" or "B" ordinary stock of a company has received a distribution of £3 6s. 6d. p.ct., it is also a matter of interest to know, without intricate calculations, what sum this absorbs.

The Wye Lighting, Heating, and Power Company, Ltd, has been registered, with offices at No. 7, Bank Street, Ashford, Kent. The capital is £5000, in £1 shares.

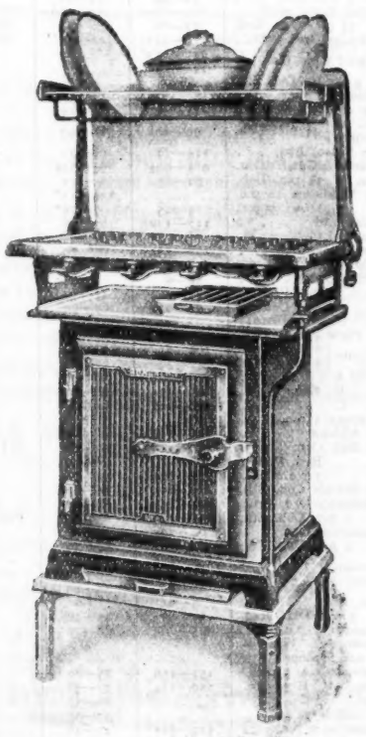
Dyestuffs (Import Regulation) Act.—The Board of Trade announce that the list of products covered by the Dyestuffs (Import Regulation) Act, which has been drawn-up in consultation with the Dyestuffs Advisory Licensing Committee, is now available, and may be obtained on application either to the Board of Trade, Industries and Manufactures Department, Great George Street, London, S.W. 1, or to the Dyestuffs Advisory Licensing Committee, Board of Trade, Danlee Buildings, No. 53, Spring Gardens, Manchester.

Borrowing Powers at Stafford.—The Gas and Electricity Committee brought forward at a meeting of the Stafford Town Council last week a proposal that application be made to the Board of Trade for an Order to enlarge the borrowing powers of the Council, for the purpose of the gas undertaking, by the sum of £70,000. It was explained that the power to borrow was sought in case of necessity, and that the sanction of the Council would be asked in the event of any actual expenditure being contemplated. Alderman Richardson moved an amendment that the paragraph be deleted from the report, in view of the heavy commitments of the Council; but eventually the report was adopted, with the recommendation.

Great Yarmouth Gas Company.—Presiding at the annual meeting, Mr. T. A. Rising said the slight increase in the balance on revenue account was, considering all the circumstances, satisfactory. During the year approximately £27,000 had been expended on capital account; the new plant being brought into operation in December. They were not yet getting the full benefit of it, as only a little over one-half the present production was from this new plant; but already there was a very substantial reduction in the manufacturing costs. For the first seven weeks of the present year more gas had been produced than in the corresponding period of 1920; and to do this they had only used 2024 tons of coal and coke, as against 2663 tons last year. Mr. P. D. Walmsley, B.Sc. (Engineer and General Manager), had had great difficulties to contend against, but had successfully overcome them.

Mainlayers' Wages at Exmouth.—A threatened strike of workmen employed in laying a new gas-main through the Exeter Road at Exmouth, has fortunately been averted. The Contractors (Messrs. Jeavons & Co.) have apparently been paying the labourers 1s. 4d. per hour, but were willing to increase the rate by a halfpenny. The current local rate in the building trade is 1s. 7½d.; and the new rate proposed by the Contractors would have come up to the accepted standard for public works, the rate of pay for which rules throughout the country at 2d. per hour below that paid on buildings. This proposal was not acceptable to the District Organizer of the Dockers' Union (Mr. S. Chilcott), who suggested a compromise. The firm offered to pay 1s. 6d. per hour, and informed Mr. Chilcott that, failing acceptance, he was at liberty to call a strike. The men, however, have agreed to continue working at the new rate.

The New "Bungalow" Cooker.



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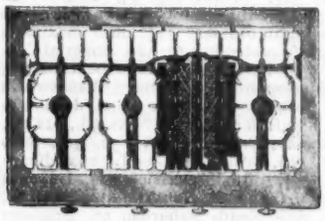

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The Richmond Gas Stove & Meter Co., Ltd.,

WARRINGTON & LONDON.

Curious Gas Fatality.—A single woman named Katherine Elizabeth Wilmott, aged 79, of Moseley, Birmingham, was found dead in her bedroom on Tuesday of last week. At the inquest it was stated that she had been asphyxiated by gas as the result of the meter, which weighed 60 lbs., falling 4 in. below its normal position, through the cupboard boards upon which it stood having rotted. The fall caused a fracture of the inlet-pipe, and the house became filled with gas. The Coroner returned a verdict of "Accidental death."

Handsworth Woodhouse Gas Company.—Mr. C. F. Ward, presiding at the annual general meeting of the Company, moved that a dividend of 8½ p.ct. be declared for the year—the same rate as for the previous year. The Managing-Director (Mr. J. W. Buxton), in seconding, said the past year had been the most strenuous the Company had ever had, owing to the uncertainty of labour and materials. Since 1914, there had been an increase of 162 p.ct. in the cost of coal, 155 p.ct. in wages, and 200 p.ct. in meters. The accounts and the dividend were approved.

Brentwood Gas Company.—The Directors report a gross profit for the past year of £5067, which, added to the balance brought forward, and deducting interest and income-tax, gives a balance available for distribution of £4018. Out of this the payment is recommended of dividends making for the year 7½ p.ct. on the original stock, and 5½ p.ct. on the additional stock. There will be a balance of £1500 to carry forward, as compared with £1319 brought into the account.

Bexhill Water and Gas Company.—The report of the Directors for the last half of 1920 states that the accounts show a balance on profit and loss available for dividend of £5758. They recommend that a dividend be declared for the half year at the rate of 4 p.ct. per annum on the capital authorized by the Acts of 1885 and 1892; at the rate of £2 16s. p.ct. per annum on the capital authorized by the Act of 1896, the Order of 1901, and the Act of 1904; and at 5 p.ct. per annum on the preference share capital, less income-tax. This (with provision for income-tax) will absorb £2971, leaving £2787 to be carried forward to the next account.

STOCK MARKET REPORT.

LAST week opened on the Stock Exchange with business very quiet, and the general tone was decidedly dull. By Wednesday, however, an approaching change was apparent, and markets were growing busier and firmer. This improvement lasted throughout the rest of the week.

The gilt-edged market, after a bad start, went better. Home Government securities wound-up well. Friday's figures for the big four were: Consols 46-46⅜, War Loan 85 7/16-86⅛, Funding 70-70¾, Victory 76½-77½. Bonds were firm; but Corporation issues were rather easier. Indians were fair. Home Rails had a very good week, both priors and ordinaries making a nice recovery. Canadians were out of favour; but Argentines were rather better.

In the Foreign Market, the feature was the continued support given to Russians on the prospect of rescue from Bolshevism; but nothing else was remarkable.

In the Miscellaneous Market, a nice recovery in many lines was effected. Oils were conspicuous in this respect, and Rubbers to a moderate degree. Shipping, Textiles, and Iron and Steel participated.

Business in the Gas Market was well up to the mark of the previous week's improved proportions; and the firm tendency was well maintained. The London Companies were very steady; the only move in quotation being a rise of 1 in Gas Light preference. The few changes noted in Suburban and Provincial were almost wholly *ex div.* adjustments. Imperial Continental was moderately dealt in within the narrow limits of 155-156⅛, and the debenture stock was raised a couple of points. Primitivas were almost unnoticed.

Bargains done for cash during the week were as follows: On Monday, Brentford "A" 51⅛, British 22⅛, European 5⅝, Gas Light ordinary 54¾, 55, 55¼, ditto maximum 41⅛, ditto debenture 46½, 47¼, 48, Imperial Continental 155, 155⅛, 155⅜, 156⅛, ditto debenture 70⅛, 71, Primitiva preference 23s. 9d., South Metropolitan 62, 62⅜, 63, South Suburban debenture 65¼, 66, Tottenham "B" 52, 53. On Tuesday, Brighton and Hove ordinary 70, European 6, 6⅛, Gas Light ordinary 54⅛, 54⅜, 54⅝, ditto maximum 42, Imperial Continental 155, 155⅛, 156⅛, ditto debenture 71⅛, South Metropolitan 61⅛, 62, 62¼, 62⅛, 62⅜, Woking District 7½ p.ct. debenture 100, Swindon United 42½, ditto debenture 82. On Wednesday, Bombay 4, Bournemouth preference 7¾, 7 13/16, Brentford "A" 52, 52⅛, British 22⅜, 23, Commercial 4 p.ct. 51⅜, Continental Union 21, European 6⅛, Gas Light ordinary 54½, ditto maximum 41½, 42, ditto preference 57, 58⅛, Imperial Continental 155, 156¼, 156⅛, ditto debenture 70⅜, South Metropolitan 62½, 62⅜, Wandsworth new 52, Brighton and Hove 5 p.ct. debenture 65, 65¼, Romford 7 p.ct. "B" 58s. 9d., 61s. 3d. On Thursday, Brentford "A" 52, 52⅛, ditto "B" 51, 51⅛, British 23, Gas Light ordinary 54⅛, 55, 55¼, ditto preference 58⅛, Imperial Continental 155, 156⅛, South Metropolitan 62, 62¼, 62⅜, 62⅞, South Suburban 57, Brighton and Hove 5 p.ct. debenture 65, 65⅛, Croydon "D" 51, 51⅛, Reading 5 p.ct. maximum 50⅛, 51. On Friday, Brentford "B" 51, Gas Light ordinary 54⅛, 55¼, ditto maximum 41, 41⅛, Lea Bridge 60, 60½, 61, Monte Video 71, South Metropolitan 63, 63¾, Tottenham debenture 57, South California 5 p.ct. preference 93.

In the Money Market, there was a good steady demand which stiffened rates alike for short loans and discount; but the pressure was relieved by the lowering of Treasury Bills' rates. Silver was but little changed. The Bank rate remains at 7 p.ct., as fixed on April 17 last.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 27	4	4%	Aldershot 4 p.c. Pref.	...	53—58	...
1,551,868	,,	Oct. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	38—43	...
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	5⅞—6⅛	4—4½	4
100,000	5	Feb. 25	16	5%	Bournemouth Gas and Water: A 5 p.c.	...	7⅞—8½	...
983,110	10	,,	7*	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	8½—9½	...
113,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	7½—8½	7⅞—7 13/16
162,065	—	Dec. 30	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	...	55—60	...
992,045	Stk.	Feb. 25	14	30/-	Brentford A Consolid.	261—266	50—55	51½—52½
734,920	,,	,,	11	26/3	Do. B New	204—209	47—52	51—52
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	95—105*	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	65—75*	70
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 15	12½	10%	British	44—45	21—23	22½—23
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	50—55	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	37—40	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	Dec. 10	—	4½%	Do. 4½ p.c. Pref.	4—6	5—6	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	55—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Feb. 25	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	51—54	51½
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	...
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	20—25	21
200,000	,,	,,	7	10%	Do. 7 p.c. Pref.	115—118	30—40	...
51,600	,,	Feb. 5	15	10%	Croydon A 10 p.c.	...	120—130	...
278,400	—	,,	12	7%	Croydon B and C 7 p.c.	..	90—100	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	5½—6½	5⅝—6½
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke: 3½ p.c. max.	76—79	39—42	54½—55½
2,600,000	,,	,,	3½	26/3	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	56—59	41—42
4,062,235	,,	,,	4	4%	Gas Light and Coke: 3 p.c. Con. Deb.	72½—74½	45—48	57—58½
4,674,850	,,	Dec. 15	3	3%	Gas Light and Coke: 10 p.c. Bonds.	...	...	46¼—48
130,000	,,	Dec. 11	10	10%	Hastings & St. L. 5 p.c.	...	...	...
82,500	,,	Mar. 11	5	3½%	Do. 3½ p.c.	...	53—58*	...
258,740	,,	,,	3½	2½%	Hongkong & China, Ltd.	87—89	37—39*	...
70,000	10	May 13	11	8%	Hornsey 7 p.c.	16½—16⅞	8½—9½	...
86,600	Stk.	Mar. 11	9	5½%	Ilford A and C	...	75—85*	...
131,000	,,	Aug. 12	7½	3½%†	Do. B	151—154	77—81	...
65,780	,,	,,	6½	2½%†	Do. 4 p.c. Deb.	115—118	57—62	...
65,500	,,	Dec. 30	4	4%	Imperial Continental	92—94	54—56	...
4,940,000	,,	,,	9	4½%	Do. 3½ p.c. Deb. Red.	150—160	155—160	155—156⅛
1,235,000	,,	Feb. 10	3½	3½%	Lea Bridge Ord. 5 p.c.	84—86	70—75	70¼—71⅛
235,242	,,	Sept. 15	6½	3½%†	Liverpool 5 p.c. Ord. A.	119—121	60—75	60—61
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. B.	211—213	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	146—148	...	...
165,736	,,	Feb. 25	7/5/6	31½%	Maidstone 5 p.c.	...	...	...
75,000	5	June 11	6	3%	Malta & Mediterranean	...	52—57	...
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne	4¼—4½	1½—2½	...
541,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd.	99—101	86—93	...
1,875,892	,,	Feb. 25	4½	3½%	Newcastle & Gatsh'dCon.	11⅛—12	68—73	71
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	98½—99½	58½—59½	...
15,000	10	Mar. 11	—	8%	North Middlesex 10 p.c.	82—83	50—51	...
55,940	10	,,	7/14/0	58%	,, ,, 7 p.c.	...	12½—13*	...
300,000	Stk.	Nov. 26	8	8%	Oriental, Ltd.	14—15	7—7½*	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	117—122	93—98	...
60,000	50	Feb. 25	13	7½%	Portsea Island, B	7—7½	2—3	...
100,000	50	,,	12	6½%	Do. C	128—131	65—70	...
249,980	3	April 29	8	—	Primitiva Ord.	118—121	50—55	...
499,960	3	June 26	5	—	Do. 5 p.c. Pref.	5—6	¾—1¼	...
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	4½—5	1½—1⅞	23/9
600,000	Stk.	Jan. 27	4	4%	Do. ,, ,, 1911	91—93	67—69	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	...	37—40	...
150,000	10	Sept. 30	6	6/-	San Paulo: 6 p.c. Pref.	85—87	37—40	...
125,000	50	Jan. 3	5	5%	San Paulo: 5 p.c. Deb.	10½—11	6½—7½	...
135,000	Stk.	Aug. 27	10	5%	Sheffield A	47—49	37—39	...
209,984	,,	,,	10	4%	Do. B	223—224	66—69	...
523,500	,,	,,	10	3½%	Do. C	222—224	66—69	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	220—222	63—65	...
90,000	10	Sept. 30	9	9%	South African	...	...	...
6,609,895	Stk.	Feb. 10	5/4/0	5%	South Met. Ord.	10½—11½	10½—11½	...
250,000	,,	Jan. 13	—	5%	Do. Red. Pref.	111—113	62—65	61½—63½
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	...	90—92	...
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	72½—74½	45—48	...
1,087,795	,,	,,	6	3½%	S'th Suburb'n Ord. 5 p.c.	157—159	86—88	...
247,358	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	114—116	56—61	57
647,740	,,	Nov. 12	7½	3½%	Southampton Ord.	116—118	63—70	65½—66
121,375	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	99—102	55—58	...
120,000	,,	Feb. 25	—	3½%	Tottenham and District: A 5 p.c.	...	57—59	...
782,275	,,	,,	6	2½%	Tottenham and District: B 3½ p.c.	135—138	57—62	...
181,255	,,	Dec. 15	4	4%	Tottenham and District: 4 p.c. Deb.	115—117	50—55	52—53
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	87—89	55—58	57
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	5—6	1—2	...
236,476	Stk.	Feb. 25	5	3½%	Tynemouth 5 p.c. max.	93—95	45—50	...
30,000	,,	Feb. 25	8½	47/6	Wandsworth, Wimbledon, and Epsom—	108½—109	68—70	...
255,636	,,	,,	6½	32/6	Wandsworth A 5 p.c.	151—156	75—80	...
108,075	,,	,,	—	33/3	Do. B 3½ p.c.	129—134	53—58	...
140,865	,,	,,	—	33/3	Do. C	...	50—55	...
352,000	,,	,,	6½	26/3	New Ordinary	...	50—55	52
98,000	,,	,,	6½	32/6	Wimbledon 5 p.c.	117—122	43—48	...
18,416	,,	Dec. 30	3	3%	Epsom 5 p.c.	121—126	50—55	...
					3 p.c. Deb. Stk.	66—69	40—45	...

* Ex Div. † Next dividend will be at this rate.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 9.]

Nos. 6544 to 7226.

AIRD, K.—"Gas-heated wash-boiler." No. 7103.
ALEXANDER, C. J.—"Air-regulators of incandescent gas-burners." No. 6850.
ANDERSON, H. A.—"Mould for concrete pipes." No. 6740.
ANDERSON, J.—"Prepayment mechanism." No. 6652.
APPS, H. J.—"Devices for automatically closing gas-supply services." No. 7199.
BUCKETT, W. J.—"Apparatus for controlling supply of gas by variation of pressure of same." No. 7031.
CHEMICAL FUEL COMPANY OF AMERICA.—"Distillation processes." No. 7025.
CHEMICAL FUEL COMPANY OF AMERICA.—"Processes of catalysis." No. 7026.
DAVIS, R. H.—"Valves of compressed-gas containers." No. 6914
DAVIS, R. H.—"Instrument for registering flow of gas." No. 7206.
DOHERTY, J.—"Gas-cocks." No. 7074.
DOHERTY, J.—"Gas-supply devices for gas-stoves, &c." No. 7075.
EUSTIS, A. H.—"Recovering sulphur dioxide from furnace gases, &c." Nos. 6783-6784.
HANSFORD, J. B.—"Apparatus for drying sulphate of ammonia, &c." No. 6686.
HARTLEY, A.—"Connecting pipes, tubes, &c." No. 7171.
HATT, C. K.—"Gas stoves, burners, &c." No. 7001.
HINKS, T.—"Gas-regulator for incandescent gas burners." No. 6802.
JUNG, A. J.—"Gas-stoves." No. 6862.
LARNER, C. W.—"Systems for controlling flow of liquids." No. 7015.
LEWIS, G. P.—"Process of sorting portions of coal according to content in earthy or mineral matters." No. 6903.
MACASKILL, D.—"Valves for compressed-gas containers." No. 6778.
MATTOCKS, H.—See Doherty. No. 7074-7075.
PLAUSON, H.—"Manufacture of hydrocarbons from carbonaceous substances, &c." No. 7160.
SARTORIS, G. U. L.—"Means for generating and utilizing gases under pressure." No. 6639.
SMITH, D. J.—"Gas-producers." No. 7139.
SMITH, E. W.—"Glands or stuffing-boxes for gas-meters." No. 7004.
SMITH METERS, LTD.—See Smith. No. 7004.
SZARVASY, I.—"Manufacture of pure retort carbon." No. 6645.
TOWL, A PEARCE.—See Hatt. No. 7001.
TULLOCH, T. G.—See Smith. No. 7139.
VIELLE, J. A.—"Manufacture of hydrocarbons from carbonaceous substances, &c." No. 7160.
WILPUTTE, L.—"Stand-pipe connections." No. 6775.
WINTER, W. A.—See Hatt. No. 7001.
WORTLEY, G. W.—See Aird. No. 7103.

Cork Gas Consumers' Company.—The report presented at the recent meeting stated that there had been a reduction in the sale of gas during the half year ended Dec. 31, owing to the operation of the military curfew regulations in the city. Residuals had yielded a fair return on the coal carbonized. The balance of profit and loss was £3070. The dividend proposed was at the rate of 6 p.ct. per annum. Mr. Joseph M'Nicholl (Engineer) reported that important repairs had been carried out on the stoking machinery and condensing plant, and that it was proposed to have extensive repairs made to the coke-handling plant. Mr. W. B. Harrington (the Chairman), in moving the adoption of the report and statement of accounts, said the results of the working of the past year had been on the whole satisfactory. The reduction in freights had been a great help, and had enabled them to meet their dividend without drawing on the reserve.

Owing to labour troubles at the Peterborough Gas-Works, considerable inconvenience was experienced by consumers at the end of last week.

The Sutherland Meter Company, Ltd., of Witton, Birmingham, have appointed Messrs. John Cawley & Co., of No. 53, Victoria Street, S.W., as their controlling agents for London and the South of England; and they have arranged with Mr. R. Seymour Tobey, late Engineer, Manager, and Secretary of the Horley District Gas Company, to act as their representative.

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